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THE TREATMENT OF CARBUNCLES BY THE ROENTGEN-RAY

Analysis of 50 Cases*

BY RICHARD U. LIGHT, M.D.,† AND MERRILL C. SOSMAN, M.D.†

THERE is no agreement as to the most reliable and efficient method of treating carbuncles, in spite of numerous discussions of this disease by writers of the past century. Some authorities adhere strongly to surgery, while others rely on conservative measures; and in a measure both groups are right for the carbuncle usually gets well. With few exceptions the carbuncle will heal if given no treatment at all, and the difficulty lies in determining what part active treatments play in assisting the healing process.

Mumford[1] wrote: "Don't coquette with a carbuncle. Cut it out as you would a cancer, and you will never regret it", and advocated total excision of the infected area. More popular than this has been the practice of making a crucial incision and undercutting cleanly, to the extremes of the induration, the four flaps thus formed. In performing this operation, Cushing advises the use of the electro-surgical instrument for cutting, because it coagulates bleeding points as it cuts, thus eliminating the hemostatic packing which defeats drainage and which is attended with such pain at removal. But surgeons have not been united in promoting operative treatment. James Paget[2], after experience with more than 200 carbuncles, said: "I fully believe that crucial incisions do not prevent extension; that it is only a limited set of cases in which the incisions diminish pain; and that in regard to the time that is occupied in healing with or without incisions, the healing without incisions is very clearly and certainly a great deal the quicker." However, there was no proof that Paget was correct, nor could there be, because each carbuncular affection runs through a "course" and one cannot tell, upon inspecting a brawny, indurated carbuncle, two inches in diameter, whether on the following day that lesion will have become soft, elevated, and definitely demarcated; or will have spread across the neck from ear to ear; or will have shown no change at all. Thus it becomes most difficult to state with confidence the exact changes ascribable to any given manoeuvre performed in the treatment of this lesion. We must learn, if possible, "what would have happened if this or that, which seems to have been successful, had not been done", through an understanding of the "natural history of the disease".

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THE CLINICAL COURSE OF THE CARBUNCLE

Occurring usually in persons with preëxisting physiological handicaps, notably diabetes and typhoid fever, the carbuncle arises from staphylococcus infection of the pilo-sebaceous apparatus of the skin. The organisms are present in the skin of healthy persons, 90% of these being the saprophitic staphylococcus pyogenes aureus, and 3% to 5% the true pathogenic staphylococcus[3]. The degree of pathogenicity of these infecting organisms may be measured by their hemolysis of rabbit blood agar. The organisms are found normally in the sebaceous glands and clefts about the roots of the hairs[4]. With such flora, abrasions resulting from irritation of the skin by a collar, the rough rub-down of athletes in training, or of whatever etiology, may easily lead to the development of furunculosis. If the infection extends the length of the hair follicle and colonizes in the deeper parts, a furuncle or boil is formed, and as the abscess develops the hair can be seen standing up in the middle of a small opaque yellow fleck. As long as this abscess remains circumscribed and drains through a single central focus, it is termed a furuncle. If it begins to burrow outward under the skin, forming a group of connected abscesses with several projecting necrotic points side by side in the skin, or if several boils coalesce, the lesion becomes a carbuncle. Anatomically, the carbuncle is like a complexly built furuncle, but its course is longer, the separation of gangrenous tissue is much more important, and it has a tendency to spread. Carbuncles are detached by peripheral suppuration and generally end by separating as sloughs, in toto, or by removal of necrotic plugs, leaving the skin pierced like a sieve[5]. Beneath these extruded cores lie velvety-red granulations which proliferate to fill in the defect, while epithelization takes place from the edges of the wound.

Carbuncles occur chiefly on the back of the neck, the lips, and the buttocks, and these lesions have regional peculiarities. No better dis-

cussion of the anatomy of the neck in its relation to carbuncular formation has been given since J. C. Warren[6] in 1882 described the columnae adiposae of the cutis vera. These fatty prolongations into the thick cervical skin provide vascular channels to the hair roots which are not situated deeply enough to reach the areolar tissue beneath. An infection of one hair root spreads with difficulty to the surface of this hide-like layer of skin but follows easily down the column of fat to the underlying areolar bed. By this process other hair roots become involved and a rapidly spreading subcutaneous infection with multiple pin-point sinuses results. When necrosis finally occurs the cutaneous areas overlying the columnae adiposae succumb first, forming the honeycombed appearance characteristic of large carbuncles of the neck. This conception of carbuncular development explains the reason for the elevation of cutaneous flaps to allow drainage from the under surface of the skin. The deeper portion of the neck is made up of strong connective tissue strands, which pass more or less perpendicular to their attachment to the underlying fascia, and many narrow compartments are present. If infection passes into this dense subcutaneous tissue a lesion similar to that in the dermis itself occurs, and collections of pus form in the compartments of the dense tissue[7]. It is thus apparent why the extensive carbuncles of this region have so protracted a convalescence, the infection lingering on in these pockets which no antiseptic can thoroughly cleanse, and no knife adequately open.

The region of the upper lip and nose, a frequent site of facial carbuncles, is quite different. The skin is thin and lies upon a loose areolar tissue. Carbuncles run short courses, quickly swell to huge proportions, and are attended by great pain. With a rich blood supply and with the additional danger imposed by the partial venous drainage through the angular vein of the face into the intracranial longitudinal sinus, surgery of these lesions is moderately hazardous. Any form of treatment is to be selected which does not openly invite sinus thrombosis.

The region of the buttocks is perhaps a compromise between these other two: the connective tissue is extensive but not dense, and the blood supply is moderate in amount.

In judging of the efficacy of a treatment, reference must be made to this natural course of the carbuncle. Clinically, this is manifested by the following stages: 1. A small pustule forms on the surface of the skin; 2. It spreads in the skin and subcutaneous tissue as a cellulitis, which is hard, tender, and painful; 3. There is a demarcation of the edges, and the surfaces heap up from edema; 4. Necrosis of the central portion occurs with liquefaction and discharge through sinuses, and sometimes the production of abscesses; 5. The infection subsides; 6. Granulation tissue develops and the skin grows in from the edges to cover the defect.

If a treatment can be found which will shorten this cycle by eliminating or hastening the onset of any of these stages, or one which will relieve the pain of the second stage, or one which will effect a healing without surgical interference, saving the patient both operation and later scar, this will be deemed an improvement in the known methods of treatment.

INTRODUCTION OF THE ROENTGEN-RAY

Soon after it became recognized that the roentgen-ray possessed the power of damaging vital tissue, experiments were conducted to test its bactericidal value in local infections. One early investigator[8], treating boils, abscesses and carbuncles with x-ray between 1902 and 1906, claimed splendid results in the five carbuncles he encountered, "aborting" four of them and "reducing" a fifth quickly. He used exposures of eight to ten minutes. Little attention was paid to this paper, however. In 1910 a case was described in which x-ray "was essayed and seemed to be a failure"[9]. This was the last report until the matter was taken up more generally following Dunham's paper in 1916[10], in which he recorded 67 consecutive carbuncles successfully treated by x-ray. He used one full therapeutic dose with the Coolidge tube, with the target at a distance of 8 inches, a 3 mm. aluminum filter, and 9 inch spark gap, totaling 35 milliampere minutes, and giving more than 10 Kienbock units. His report was meagre, however, and gave no case histories and no basis for comparison, and we are left wondering what Sir James Paget would have said of the splendid results attained. Other reports of success in the treatment of carbuncles by radiation followed[11, 12], and from the studies of the past eight years we find that radiologists have developed several views in common. Relief of pain and a shortened course for small and medium sized lesions is noted after roentgen-therapy by Lewis[13], Hodges[14, 15], and Andrews[16]. Carp[17] also recommends radiation of small, superficial lesions, but advises that all large lesions, both diabetic and non-diabetic, be operated upon. Most are agreed on the advantage that radiation holds over surgery from the cosmetic standpoint, and on its desirability in lesions of the face. In the presence of diabetes, surgery is urged by Carp and Andrews. Richards[18] stresses the value of roentgen-therapy in regions other than the back of the neck, and the added safety of radiation over surgical intervention is brought out by Lewis. In a review of the therapy of carbuncles, Christopher[19] quotes Berndt and Heidehain as supporting this treatment.

Yet, in the face of numerous strong recommendations for this form of treatment, several authors of comprehensive discussions on carbuncles make no mention of roentgen-therapy, and it is doubtful if the knowledge of its usefulness is very widely disseminated. Phillips[20], in a splendid "Dissertation" which renews

Paget's discouraging remarks on the uselessness of surgery, "for most carbuncles will heal up without operation", has no note of radiation as a possible form of treatment, although he includes all of the older forms. In another fine British paper, Griffiths[21] overlooks x-ray, and Fife[22], in this country, states only that in his experience x-ray to small carbuncles does not abort them. So we come to the realization that the only radical change introduced in the past century in the methods of treating carbuncular affections has met with but meagre study, the aggregate published experience having a basis of perhaps two hundred cases, and that the knowledge of its alleged efficacy is still rather limited.

ANALYSIS OF 50 CASES

During the past six years the Peter Bent Brigham Hospital has afforded roentgen-therapy to 64 patients with carbuncles, but of these the records of 8 are too meagre to be of assistance, and in 6 other cases the coincidence of x-ray and surgery makes it impossible to determine which therapy gave the patient the most benefit. We have then 50 cases of radiated carbuncles from which to draw conclusions.

The observations upon which this study is based were made by numerous persons, and an effort has been made to correlate these to simple standards. Improvement of a lesion resulting from radiation is deemed to be any shortening of the cycle of the carbuncle from its "natural course", as outlined above, occurring in close relationship to the time of radiation. Of the 50 cases analyzed, 34 are held to have been improved by roentgen-therapy, and 16 to have received no benefit from this treatment.

70% of the carbuncles occurred in males and of this group x-ray benefited 60%, whereas 87% of carbuncles in women improved as a result of radiation. The background for this is better understood from Table I.

TABLE I

COMPARATIVE VALUE OF ROENTGEN-THERAPY ACCORDING TO SEX AND TO LOCATION OF CARBUNCLE

	Male		*Female*	
	X-ray of help	Of no help	X-ray of help	Of no help
Neck	15	11	3	
Face	2		6	1
Scalp		1	2	
Back	2	1	1	
Extremity	1	1		
Axilla	1		1	1

Radiation was useless in 40% of carbuncles of the neck in males, but it caused improvement in all of the cervical carbuncles in females, and in eight out of nine of all facial carbuncles. As a corollary to this, roentgen-therapy was more valuable in young subjects than in older people, because lesions of the neck occurred principally in the fifth and sixth and seventh decades, while those of the face were massed in the second and third decades.

The tendency to repeated infections in patients who experienced carbuncles is shown by the fact that 42% of the patients had undergone other staphylococcal infections, either before or after the lesion mentioned here. Radiation was found to be somewhat less effective in those with chronic infections.

For the prospective therapist, perhaps the most important single determination is to know at what stage of the disease one can expect the x-ray to be of use. Of the total series, the average age* from incipiency to the day of radiation was 14.3 days for the group benefited by x-ray, and 10.7 days for the others. This is better understood by noticing that carbuncles of the neck alone responded best at an (average) age of 16.2 days while the failures averaged 9.7 days. Quite the opposite is observed of facial lesions, where the average duration of the illness was 5.7 days, and eight out of nine responded well. More valuable even than the age of the lesion in days, is its clinical appearance at the time of radiation. Quite obviously, most patients consult the doctor only after their carbuncles have given considerable discomfort and have progressed moderately well along their course, so we find some lesions are in the stage of induration, some have beginning necrosis and draining sinuses superimposed on this induration, and others are actually fluctuant. Of the group presenting induration alone (16 cases) 75% were improved by radiation; of those which were fluctuant (10 cases) one-half were made better by x-ray, and of those 24 which showed both multiple sinuses and induration, 70% benefited by radiation. From this it may be inferred that in the presence of collections of pus x-ray is not the treatment of choice, but that it will in a large proportion of cases of beginning necrosis accelerate this process or cause shrinkage. In a similar proportion of lesions presenting simple induration and swelling, radiation also hastens the onset of the next stage. This raises a crucial point, for the improvement accredited to x-ray therapy is just that which might have occurred in the absence of any treatment, yet in the opinion of the observer in each case, this change was so striking in contrast to the preceding course of the lesion that it was attributed to this therapy.

Another comparison of value in selecting lesions most likely to respond well to radiation is the size of the lesion.

The value of radiation decreases somewhat in larger lesions, but assistance is afforded, however, to three-fifths of those over 9 cm. in diameter. Two patients with extensive carbuncles died.

*The "number of days old" is based on 39 carbuncles, whose ages are accurately known.

Although two-thirds of the patients went through the illness without surgical interference, the study of those cases in which surgery was employed is most interesting. Eleven patients were given x-ray therapy after operation. Some of them had had small and perhaps inadequate incisions, but in seven instances after wide incision and undercutting, the carbuncle continued to spread beyond the end of the incisions and this invasive process was halted immediately by radiation. For twelve cases x-ray treatment paved the way to more successful surgery by hastening the development of fluctuant areas which were opened with small incisions or by virtue of the production of a necrotic core which was lifted away. X-ray failed of its purpose in 16 instances, twice following surgical procedures, 6 times where surgery was used both before and after the radiation, and in 7 cases where surgery was resorted to only after no improvement was observed following x-ray therapy. One case was complicated by an infection which was thought to be tuberculous. Where x-ray failed to benefit, the operation was done primarily to excise the infected area; where it was of assistance, small incisions for drainage were the rule.

TABLE II

RESULTS OF ROENTGEN-THERAPY ACCORDING TO THE SIZE OF THE LESION

	X-ray helpful	X-ray of no use	Total cases in each group
Small (under 5 cm.)	75%	25%	24
Medium (5-9 cm.)	70%	30%	10
Large (9 cm. and up)	60%	40%	17

(Based on 51 carbuncles, one patient having had two lesions simultaneously.)

Unfortunately, there is no satisfactory comparison to be made concerning the accessory forms of treatment employed. About half of the patients were hospitalized and the rest visited the out-door-department. Most of the lesions were treated with heat in some form, but there was no other type of treatment uniformly used. Injections of vaccine, usually of the autogenous type, were given to some of the chronic cases and without good effects; the open wounds were dressed, some with Dakin's solution, some with dichloramin-T, some with hexylresorcinol, and a few were given Alpine lamp baths during the healing stage. One patient had no supplementary treatment other than a dry dressing to protect the clothing.

The method of treatment was in every instance to protect the parts surrounding the lesion with lead sheeting, exposing only the lesion and about 1 cm. of healthy tissue outside the indurated area. Various thicknesses and combinations of copper, aluminum and leather filters were used and yet the proportional effectiveness of each combination and of the average of all filtered radiations was nearly that of the cases in which no filter was used. (Filters used in 38 cases, no filters in 12 cases.) The dosage ranged from 30% to 50% of an erythema dose.

The specific effect of radiation on the carbuncles was noted in most cases to be an acceleration of the normal course of the lesion, and on viewing the progress notes made before and after radiation one judges that it promoted necrosis. Increased drainage resulted in sixteen instances; softening occurred in nine; dehydration, causing a regression without drainage, took place in six cases; and rapid peripheral extension was checked in two. In ten cases the relief from pain was a prominent feature, and in one this was the only benefit attributable to x-ray.

We may speculate on the action of radiation which produces these changes. In the doses available, those which are below the level of harm to human tissue, there is no bactericidal effect. It is certain that heat from the tube is not a factor inasmuch as in three-quarters of the exposures, filters were interposed, and in many wet cloths were deliberately left in contact with the carbuncles. The suggestion has been made that the roentgen-ray exerts a direct action on the vascular bed by dilating the vessels, and later causing a diminution of their caliber, possibly sealing off the area involved. This conception has not been proven, and seems improbable. A more tenable concept is that leucocytes and lymphocytes are easily killed by radiation, with liberation of enzymes which assist necrosis of infected tissue and infecting organisms.

Death intervened in two instances. One was a diabetic man of 79, recovering from a suprapubic prostatectomy, who developed a carbuncle of the back. Several surgical procedures were performed on the lesion and it was radiated after the first of these. The carbuncle spread in spite of treatment, and he died of circulatory failure. The other is discussed in case 3. In one instance the patient was debilitated by diabetes, age, and recent operation; in the other, a very much neglected lesion had gained great headway, and neither radiation nor radical surgery was able to save the man's life.

It is impossible to compare different cases according to the duration of illness, because the sizes of the lesions vary, and the records in many instances are not clear as to the exact onset of the illness and the time at which complete healing was effected. The best comparison is that of two carbuncles of about equal size occurring in the same individual within a year (case 5). Improvement was "very clearly and certainly a great deal the quicker", in the lesion which was healed by radiation alone than it was in that which was treated surgically. It may be presumed that any agent which hastens the softening and drainage of carbuncles, shortens the elapsed time for those carbuncles to run through their cycles.

Unfortunately again, cultural studies were made of only 13 carbuncles. In 10 of these the infecting agent was staphylococcus aureus, in 2 staphylococcus albus, and in 1 streptococcus non-hemolyticus combined with staphylococcus aureus. From such a meagre knowledge of cultural characteristics no conclusions can be drawn as to the type of organism which best reacts to treatment with radiation.

REPORT OF 5 CASES

CASE 1—CARBUNCLE OF 7 CM. DIAMETER, WHICH SPREAD AFTER WIDE INCISION, BUT REACTED TO ROENTGEN-THERAPY

J. B., a 50 year old Scotch laborer, visited the out-door-department on September 30, 1929, because of a carbuncle on the back of the right shoulder which measured 7½ cm. across the indurated area. It had started 10 days previously as a boil and had been enlarging progressively. Two long incisions were made in a cruciate manner, with under-cutting of the flaps, using gas-oxygen—ether anaesthesia, and the patient was hospitalized. On the following day his temperature rose to 102°, there was a leucocyte count of 19,000 and the induration remained essentially unchanged. On the fourth day after the operation the lesion had spread to a diameter of 10 cm., still retained its indurated character, discharged but little, and resort was had to a 42% erythema dose of x-ray over an area of 20 cm. diameter, filtered through ¼ mm. copper and 1 mm. aluminum. Within twenty-four hours the lesion had softened greatly and free drainage had set in. Hot packs were applied, and on the 5th day (after x-ray) drainage was still moderately copious but the tissues were quite soft and the temperature had fallen to 99°, and on the 9th day the wound was healing. Two days later, when the patient was discharged from the hospital, only a shallow ulcer remained, measuring 3 cm. across.

Further progress, as noted in the out-door-department, showed rapid healing so that on the 29th day following radiation the repair was complete. At no time in the course of the disease was sugar detected in the urine, nor was there a history of diabetes.

CASE 2—LARGE CARBUNCLE OF CHIN AND LIP, TREATED BY X-RAY, WITHOUT SURGERY

L. D., a 21 year old American student nurse was admitted to the hospital on October 3, 1929, because a small boil, which appeared on the left side of the chin two days before, and had increased to the size of a half-dollar. The lesion covered the chin and lower lip, was moderately swollen and indurated, and had three small discharging points. There was no lymphadenitis. Her temperature was 98°, leucocyte count 14,000, and the urine examination negative, and she gave evidence of little general reaction. The lesion was treated with continuous hot packs during the daytime, with the patient at rest in bed, but it grew in size and discomfort so much that four days later, when the greatly swollen carbuncle covered an area of about 7 cm., the severe pain necessitated numerous administrations of morphia. There was as yet little discharge from the lesion. Her temperature had reached 101° and leucocytosis 18,000.

The lesion was given 33% of an erythema dose by x-ray, over an area 10 cm. in diameter, through a filter of ¼ mm. copper and 1 mm. aluminum. The results of this treatment were striking. Within two hours drainage had increased tremendously, and by the following day the pain was largely gone and there was marked constitutional improvement. On the second day after x-ray the pain had entirely subsided, discharge was free, the induration had been reduced to a diameter of 2 cm., and the temperature had fallen to normal. The patient was this day discharged from the ward, and the lesion healed without a scar.

CASE 3—NEGLECTED CARBUNCLE OF NECK WHICH REACTED POORLY TO X-RAY, WAS OPERATED UPON WITH WIDE SUBOCCIPITAL FLAPS, AND RESULTED IN DEATH

H. S., a California-born Chinese laundryman of 55, entered the hospital on February 6, 1930 with a carbuncle of the neck which had begun two weeks before with a "sore neck". As it developed he noticed that he became more thirsty, had frequency of urination, tired easily and lost nearly 10 pounds in weight. There was no history of previous diabetic symptoms, although he had experienced one previous neck infection. On admission he was possessed of a huge carbuncle measuring 15 cm. laterally (nearly from ear to ear) and 7 cm. in a vertical plane, which was very tender and showed many sinuses exuding pus. His eye lids were puffy, and the urine contained numerous hyaline casts. Leucocytosis was 14,000, and his temperature 98.6°. The lesion was radiated on the same day, being given 40% of an erythema dose through 3 mm. of aluminum over the whole area. Flaxseed poultices were applied.

On the following day his condition was worse, inasmuch as the temperature had risen to 101°, and the white blood cell count to 25,000, although the lesion remained unchanged. On the 2nd day after radiation the urine contained sugar for the first time, coupled with ketone bodies, and 10 units of insulin were administered. His general responses were poor, he was hard to arouse and the leucocytosis was now 33,000. In the afternoon of the 3rd day, operation was deemed advisable, and Dr. Cushing laid back two large suboccipital flaps by electro-surgical methods, also undercutting and incising the upper and lower border of the wound. Twenty-five units of insulin were administered during this day. The urine continued to hold numerous hyaline casts, but the phthalein test showed good kidney function, 60% the first hour, 15% the second. On the 4th day there was an improvement in responses, and profuse drainage from the wound. The urine was sugar and acetone-free and remained so until the end, on 10 to 15 units of insulin. The following day brought a drop in temperature to 99.5°, but the limits of involvement of the carbuncle were little changed, and it was still much indurated. Drainage was profuse. The flaps were becoming necrotic at the edges and were laid against a rubber tissue lining of the wound to assist free flow of fluid. On the following two days his temperature rose to 104°, the pulse became sluggish in quality and he was very uncomfortable. Hot packs were continued at the back of the neck, and he was given sponge baths every half hour. The lesion showed slight improvement; the edema disappeared, leaving a wrinkled skin, and there was no extension of the process. Dichloramin-T packs were supplied, in place of heat. On the 8th day, following an encouragingly peaceful night, his radial pulse became weak, temperature fell to 100°, and in the afternoon he died suddenly and without warning. Autopsy revealed no emboli, and "death from toxemia" was given as the cause of death.

CASE 4—A PATIENT WITH TWIN CARBUNCLES IN AN ANAESTHETIC AREA OF THE NECK, FOLLOWING SECTION OF POSTERIOR CERVICAL NERVE ROOTS.

W. H., a 42 year old unmarried manufacturer, who previously had had a section of the posterior nerve roots of the cervical region for spasmodic torticollis,

reëntered the hospital on June 7, 1929, because of two carbuncles which had developed on either side of the healed midline incision in the neck. Being situated in the anaesthetic area these were painless and their presence was discovered accidentally while the patient was adjusting his collar. He had had no constitutional disturbance. His temperature was 101°, white blood cell count 9,000, and the urine was free of sugar. Each carbuncle was about 3 cm. across, with a somewhat wider area of induration; that on the right showed slight necrosis. There was no lymphadenitis. Each lesion was given radiation, using a 2 mm. aluminum filter and 10 minutes of exposure. On the following day the lesion on the right was discharging but that on the left remained unchanged; the 3rd day following radiation brought a subsiding of the right carbuncle, which had discharged a considerable amount of necrotic tissue, and a necrosis of the left one; on the 6th a large "core" of necrotic tissue was delivered from the tardy lesion on the left, which still retained some induration, and the other lesion was healing. The left carbuncle was much softened by the 10th, and at discharge from the hospital on the 13th day after x-ray, was almost entirely soft. Both lesions were then healing. A note in Dr. Cushing's hand points out that "The interesting feature of this case is that the carbuncles were in the anaesthetic field of the neck and they got well under way without the patient having any local discomfort." Of almost equal interest is that in the absence of pain, the two carbuncles gave rise to no constitutional disturbance.

CASE 5—EARLY CARBUNCLE OF NECK TREATED SOLELY WITH X-RAY

W. H., a 74 year old business man in good health consulted Dr. Homans on February 13, 1930, four days after the incipiency of a carbuncle on the back of the neck, just to the left of the midline. He had experienced a similar lesion within the year, and showed a cruciate scar on the right side of the neck. He had no history of diabetic symptoms. The lesion was indurated, nearly flat, moderately painful, and measured 5 cm. in diameter. There was no evidence of necrosis. The carbuncle was given a radiation of six minutes (50% of an erythema dose) through 1 mm. of aluminum, and its course followed with care. The patient remained up and about and went regularly to his office, and his carbuncle received no accessory treatment other than a dry dressing to protect his clothing. On the day after radiation the lesion was painless, but had shown no softening and only slight elevation above the surface, and a second radiation was given, of 40% of an erythema dose through a 1 mm. aluminum filter. The day following the second radiation brought a further heaping up from the surface, but without pain, and without any softening. On the 3rd day, a pin point of discharge was seen, and the next day a small crater and two other small openings appeared on the crest of the lesion, now considerably elevated. At the same time the edges had softened, so that it measured about ½ cm. smaller than formerly. The only discomfort came from a swollen postauricular gland. By the 6th numerous openings had been formed, but the discharge from these was moderate, and the 9th day brought distinct improvement so that the whole lesion was much softer, the periphery was healing, and the center was standing up still more pointedly. It looked as though a necrotic plug must come out soon. On the 13th the induration had entirely disappeared, the area of redness measured 3½ x 2½ cm., and there had been but slight drainage. Three days later the carbuncle was shrinking and quite soft, and on the 17th day was very much shrunken in area and elevation. The necrotic material had been absorbed because no mass had been delivered and drainage had been inconspicuous. The lesion was now clean. Complete healing was effected in 30 days without operation or interference with his business duties. An earlier carbuncle of approximately the same size in this patient required hospitalization and cruciate incision under gas-anaesthesia, with a longer convalescence, and a subsequent scar.

SUMMARY

The addition of the roentgen-ray to the therapy of carbuncles gives promise of being perhaps the most valuable innovation of the past century. The surgeons' methods have not changed, their chief reliance being two incisions crucially placed, from border to border, with dissection of necrotic material from beneath the flaps, a method recently modified by the introduction of electro-surgery; the non-operative methods of treatment are legion in number, but no one of these has received more than local approbation.

Radiation of carbuncles is not consistently followed by improvement, and it is most important to determine the types of cases in which x-ray is likely to be of value. As in all other forms of carbuncular treatment, an improvement of the lesion occurring after radiation may be ascribable either to the effects of the x-ray or to the normal course of the carbuncle, for most carbuncles will heal if no treatment is afforded them.

From a study of 50 cases of carbuncle treated with x-ray in this hospital, it was concluded that when benefit occurred it lay usually in a hastened necrosis of the lesion, a softening or liquefaction of a carbuncle in the indurated stage. In a few instances the spreading tendencies of the lesions were checked, and healing occurred by drying up and absorption without any extensive drainage of necrotic products. X-ray therapy was occasionally employed with success following surgical procedures which failed to halt the spread of the carbuncle, and in these the activity of the infectious process was diminished and the peripheral spread halted. Relief of pain occurred in some instances of cervical carbuncles and, quite strikingly, in most of those of the face.

Of the entire series, 34 cases were observed to have been improved by roentgen-therapy, and 16 to have received no benefit from this treatment. Of those occurring in women, 13 out of 15 were improved; in men, where the site of predilection was the neck, three-fifths were helped by radiation. 8 of the 9 carbuncles of the face responded excellently as did most of those of the extremities. The proportionate success of roentgen-therapy diminished somewhat with the increasing size of the lesion: 75% of those under 5 cm. diameter were benefited, whereas but 60% of those larger than 9 cm. diameter improved as a result of x-ray.

Diabetes seemed to have little bearing on the chances of success from radiation, although most other observers advise that surgery be immediately employed if the patient is a diabetic.

Two chief difficulties confront the investigator of roentgen-therapy of carbuncles: first, to determine whether the improvement would have occurred spontaneously; second, to withhold the hand of the anxious surgeon until the effects of the x-ray can be determined. The fact that the majority of patients treated by roentgen-therapy derived benefit therefrom leads us to believe that a much larger proportion than the 33% of this series, could have been treated by radiation alone, without surgical interference.

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THE PHYSIOLOGICAL BASIS OF THE SURGERY OF THE SYMPATHETIC NERVOUS SYSTEM*

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IN discussing the physiological basis of operations on the sympathetic nervous system I propose first to describe briefly the relation of this system to the general physiology of the organism. The problems of spastic paralysis, and of periarterial sympathectomy will then be considered in some detail, and I shall close with a few words about the physiological indications for the operation of ramisection.

I. THE "MILIEU INTÉRIEUR" AND ITS REGULATION

More than fifty years ago Claude Bernard[1] concluded that during evolution the animal body became independent of its external environment only after developing a mechanism for maintaining the constancy of what he designated the "*milieu intérieur*", *i.e.*, "the internal environment". This comprehensive term includes all of the fluids of the body—blood, lymph, cerebrospinal fluid, etc.,—and Bernard[1] pointed out, in the case of higher animals, that the most striking characteristic of these internal fluids is their remarkable constancy of composition. He accordingly inferred that their mechanism of regulation must be extremely delicate, and suggested, with his characteristic prescience, that the adjustments are probably made chiefly by the nervous system. A half century elapsed before the significance of this extraordinary prediction was appreciated. Buffer systems were discovered, the chemical activities of haemoglobin and carbon dioxide were elucidated, but no one prior to Cannon[2] had fully realized that the sympathetic branch of the autonomic system is the regulator *par excellence* of the composition of bodily fluids, especially in times of stress. This important generalization was first set forth by Cannon several years ago[2], and now, thanks largely to the work of Beattie, Long and their collaborators[3] at Montreal on the central connections of the sympathetic system, the whole picture is much more complete. It is now clear that the head ganglion of the sympathetic lies in the region of the hypothalamus, and that it is this part of the brain which regulates the metabolism of fats and carbohydrates, the water balance of the body, rate of heart beat, and probably also the action of the capillaries and sudorific glands. Here then, we have the full realization of the prediction made by Claude Bernard in 1878: a region of the central nervous system controlling those processes which serve to adjust the reactions of the *milieu intérieur*.

In his work on the relation of the sympathetic system to body fluids, Cannon made a useful distinction between the activities of the cerebrospinal nervous system which enables the body to respond to changes in the external environment, and the sympathetic system which responds to alterations in the internal environment. The adjustments wrought by the first system were termed by Cannon "exterofection", while the internal adjustments were designated "interofection". It is the excessive activity of the exterofective system which generally leads to disturbances of the inner fluid matrix, and this in turn initiates interofective activity of the

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sympathetic system. Normally, in the sheltered existence of a laboratory an animal has little occasion for emergency adjustments made by the sympathetic system, and Cannon has been able to show that an animal whose entire peripheral sympathetic system has been extirpated is able to exist without difficulty so long as it is not exposed to extremes of temperature or to any other relatively severe condition which would require a struggle for existence[4].

The surgeon then, who undertakes to sever or to remove any part of the sympathetic nervous system, can comfort himself in the assurance that he is not interfering with a structure essential to life, but he must nevertheless realize that he is destroying a part of one of the oldest and most fundamental systems regulating the bodily economy. He may be called upon to cut the splanchnic nerve in order to assist in failing kidney, or to remove the abdominal sympathetic chain to alleviate the distressing symptoms of Hirschsprung's disease[5].

The rationale of these two operations is obvious, the second having been amply justified by the results achieved, and any comment from a physiologist is really superfluous.

II. RAMISECTION, POSTURE AND SPASTIC PARALYSIS

There is a more serious problem, however, relating to the influence which the sympathetic branch of the autonomic system is said to exert upon the skeletal musculature, and it is here that we are face to face with one of the most interesting controversies of modern neurophysiology. It has been observed by some that removal of the sympathetic supply of muscles diminishes for a time the degree of their resting contraction. Anyone who has studied clinical cases with sufficient care will realize that this is unquestionably true, and it appears also to be true in the lower animals in which, however, the alteration soon passes off (See Knutz[6]). In man it is scarcely perceptible after 8 or 9 months.

As Dr. Royle is here today, I should like to mention a case which he operated upon, and which I had the privilege of following before and for some years after unilateral cervical, and lumbar ramisection. The case, which was reported[7] a year after operation, was a typical instance of Raynaud's disease, equally advanced on the two sides, but the upper extremities were more seriously involved than the lower, the fingers having reached the stage of early sloughing of the terminal phalanges, and the lower extremities being subject merely to extreme vasomotor spasm. Prior to operation, muscular coördination, deep reflexes and the resting tonus of the limbs were equal. Within 20 minutes after complete right-sided lumbar ramisection, the right knee-jerk became pendular in character, and the resting tonus of the right quadriceps muscle considerably diminished (as judged by the flaccidity of the patella, it being freely movable from side to side by gentle palpation in all positions of the leg, while on the left the usual resistance to such a manoeuvre was still present). These slight differences continued without change for 7 or 8 months; they then grew considerably less marked, but are still recognizable at the present time, 3½ years after the operation. The changes were not of such a nature as to cause any difficulty in locomotion, since the tonus of the right extremity was certainly not abolished. The important fact is that there was a difference in the resting posture after ramisection.

The explanation of this phenomenon offered thus far by physiologists has not been wholly satisfactory to themselves or to their clinical colleagues. We have been asked whether the sympathetic nervous system regulates postural contraction, and if it does not, how are we to account for the changes following ramisection. To discuss this it will be necessary first to summarize briefly what is known concerning the mechanism of posture.

Six years ago Liddell and Sherrington[8] discovered that anti-gravity muscles of cats and dogs respond to stretch by active reflex contraction. The response persists so long as the stretch is applied and is usually confined to the muscles immediately affected by the stretch stimulus. The response is completely abolished by section of appropriate anterior or posterior roots. These observers inferred that the response to stretch is the basic reflex in the maintenance of posture, since by its operation the body would be maintained in its normal standing position. In conditions causing hypotonia, *e.g.*, spinal shock, or disturbances of the vestibular nuclei, the stretch reflex is diminished or absent. One has every reason, therefore, to accept the interpretation of Liddell and Sherrington, and we may now inquire into the neural mechanism of the important reaction which they describe.

The most significant studies bearing upon the question are those of Denny-Brown[9], who examined the stretch reflex of the red muscle, soleus, an ankle extensor, and found, when slight degrees of stretch were applied, that it was possible to evoke a response mediated by a single motor nerve fibre, and he made the important discovery that the rate of discharge of such a single unit is relatively slow, *e.g.*, 9 to 10 per second, and that the response persists for an indefinite period of time without fatigue or alteration in the rate of discharge. Section of the posterior roots supplying the soleus muscle abolished the reaction, as did also section of appropriate anterior roots. Complete removal of the sympathetic, on the other hand, was without detectable influence upon the reflex. Adrenalin and other sympathomimetic drugs do not influence it. This was controlled in various ways and upon other muscles, and the result was invariably the same, *i.e.*, the stretch reflex remained apparently unchanged when the sympathetic system was removed or when it was stimulated. It is remotely possible that ramisection increases the threshold of the stretch reflex, but it clearly does not destroy it. The elaborate dissection required for study of the reaction does

not permit the detection of small changes in its threshold.

How then, are we to explain the undoubted diminution in resting tonus of the quadriceps muscle, for example, of a normal human being after ramisection? Recent studies, such as those of Wilkinson[10], Hinsey[11] and others, have failed to confirm the conclusion of Boeke[12], that every muscle fibre has an accessory sympathetic nerve. Wilkinson goes so far as to say that no skeletal muscle fibre receives a sympathetic nerve ending, and other, more cautious histologists conclude that not more than 1% could possible have such innervation. Sympathetic fibres have, however, been traced to the capillaries of muscle, and there is reason to believe that this is the chief destination of the post-ganglionic fibres passing to muscle. It might be urged, therefore, that the change in tonus is due in some indirect way to an alteration in the vasomotor control of the muscle itself; while one cannot dismiss the possibility, it has never seemed to me highly probable, since vasomotor tone recovers much sooner than the postural disturbance. There is another possibility, relating to the so-called intrafusal fibres. It is well known that in addition to a sensory ending, these fibres receive in the region of their sensory spindle an unmedullated fibre, which is almost certainly sympathetic in origin. These degenerate after ramisection and it is possible that destruction of the sympathetic innervation of sensory end-organs concerned in the regulation of stretch reflexes causes an alteration in their threshold of stimulation. Other factors, such as changes in the local circulation in the spinal cord, though possibly of importance, cannot be assayed since there is at present no way of isolating them for study.

One is forced therefore to conclude that the sympathetic is not essential for the maintenance of normal reflex posture or the exaggerated postures of spastic paralysis, and that any influence which it may appear to exert is purely secondary and due to an obscure effect upon the well known somatic reflex mechanism. Whether this secondary influence is of sufficient magnitude to justify surgical ramisection in cases of spastic paralysis is still an open question. Though it is difficult to find clear-cut physiological justification for such a procedure and though many case reports are unconvincing, one cannot overlook certain of the evidence of reliable clinical observers who claim that ramisection has caused in certain spastic cases permanent and beneficial diminution in rigidity.

Much less, however, can be said of the periarterial operation.

III. PERIARTERIAL "SYMPATHECTOMY"

The operation of stripping arteries of their outer coat was introduced, chiefly on empirical grounds, in the belief that a large number of vasoconstrictors pass in the walls of the large arterial trunks to the small arteries of the extremities (Full historical details are given by Kuntz[6]). There is no doubt that in a normal animal periarterial stripping leads temporarily to increased vascularity of the parts supplied by the artery. This has also been amply confirmed in man by Leriche and Fontaine[13] and many others. The experiments of Rogers and Hemingway[14] are the most complete of those carried out on animals. When the carotid artery of an albino rabbit was stripped and painted with phenol, vascular engorgement occurred in the ear on the same side and lasted two to three days, but it then passed off completely. Section of the cervical sympathetic, on the other hand, caused a more marked engorgement of the ear and proved to be of much greater duration. "Sympathectomy" of the femoral artery also produced transient vasodilatation of the corresponding extremity easily demonstrated by the use of acetyl choline and adrenaline.

Recent anatomical studies of the innervation of the larger arteries cast further doubt upon the rationale of periarterial sympathectomy. Kuntz has examined the question in some detail and offers unimpeachable evidence that there are no long vasomotor fibres passing distally along peripheral vessels. The carotid artery, however, appears to be a somewhat special case, for branches of the superior cervical ganglion undoubtedly pass by this route to the head. In the peripheral arteries, however, there is ample evidence of large numbers of sensory fibres, apparently subserving pain, and the periarterial operation, if properly performed, undoubtedly destroys this group. There are many clinical cases on record, and a certain amount of experimental evidence, indicating that after all nerves to a given extremity have been severed, pain may still be perceived, disappearing only after the artery has been ligated. Foerster[15] of Breslau has reported a large number of cases, all of them convincing, and Abrashonow[16] reports that a dog whose leg had had all its peripheral nerves cut gave distinct evidence of pain when acid was injected into the femoral artery below the level at which the nerves had been severed. On division of the artery and subsequent injection of acid into its distal stump, no evidence of pain was seen.

On the basis of all this evidence, I am inclined to agree with Archibald[17] that both from the clinical and physiological point of view, the chief value in the operation of periarterial sympathectomy lies in the possibility of relieving pain. Archibald points out that in cases of threatening gangrene of the foot, the relief following arterial stripping may be prompt and dramatic, and others have found it beneficial in stubborn causalgias.

The mechanism of the temporary dilatation following arterial stripping is not clear, but is most probably the result of an active reflex since it is stated that the opposite extremity is often similarly affected.

IV. PHYSIOLOGICAL INDICATIONS FOR RAMISECTION

Apart from Hirschsprung's disease and certain bladder conditions, the only unquestioned physiological indications for ramisection are those relating to conditions of ischaemia. *Any pathological process in which healing would be greatly accelerated by an increased blood supply offers an indication for ramisection, especially if the morbid process threatens the existence of an extremity.* Thus in Raynaud's disease the advantages of the operation are obvious since the chief symptoms are due to local impairment of the circulation. Or, to take another instance, the improvement in certain types of arthritis brought about by ramisection is almost certainly attributable to the resulting hyperaemia. It must be borne in mind that there are other methods of producing hyperaemia, *e.g.*, heat, mustard, protein shock, tourniquets, spinal anaesthesia and the Finsen lamp, but removal of the vasoconstrictors is a far more effective and lasting means of increasing the vascularity of a part, and I may venture to say that it is more "physiological" in that it does not set up a local condition verging upon inflammation. Since it is a major operation it is not to be undertaken lightly, and when an extremity is concerned, probably never unless its loss is imminent.

I have purposely referred to the indications for ramisection in the broadest possible terms, for there are undoubtedly many chronic conditions, hitherto uninvestigated, which will be found to respond to the hyperaemia which follows this operation. One would like, for example, to see further studies on the effects of ramisection or ganglionectomy on various forms of chronic ulceration, *e.g.*, diabetic gangrene, and one would welcome further clinical investigation of the effect of section of the splanchnics on the failing kidney. There are also a host of dermatological conditions requiring investigation from this point of view. Much more important, however, is the problem of collateral circulation.

There is much *a priori* evidence that collateral circulation in a limb is established more readily after the sympathetic nerve supply has been destroyed than in a normal limb. When a great vessel such as the iliac or the femoral becomes suddenly occluded, the temperature of the part falls (Ferris and Harvey[18]), nerves become stimulated, pain ensues, and the reflex result is extreme vasoconstriction. This is the beginning of a vicious circle which impedes the establishment of collateral circulation from other vessels of the limb. If the possibility of reflex vasoconstriction were prevented by ramisection it is highly probable that collateral circulation would be established much earlier. I am therefore confident that a limb in early gangrene from thrombosis should never be amputated without first giving it the benefit of ramisection. Surgical observers are in an advantageous position since they can investigate problems of this character far more effectively than in a physiological laboratory and one hopes that before another year passes they will have solved the important question of the relation of the sympathetic to the collateral circulation.

In closing I would add one word of caution concerning the *post hoc, propter hoc* reasoning so common in the literature of this subject. One cannot emphasize too strongly that disturbances which are benefited by ramisection are not necessarily due to hyperactivity of the sympathetic. Even with Raynaud's disease there is some evidence, especially that recently advanced by Lewis[20, 21], pointing to its being a purely local condition having little to do with the sympathetic nervous system. The increased blood supply which comes of removing the vasoconstrictors is of value only in so far as it helps to counteract the local process. The same is clearly true of arthritis, thrombosis, spastic paralysis, diabetic ulceration and angina pectoris, and I see no reason for concluding, as some writers have done, that Hirschsprung's disease is due necessarily to generalized increase in activity of the sympathetic. The question of cause and effect should be kept quite separate, and the results of ramisection not confounded with the etiology of the condition it is intended to relieve.

SUMMARY

In the general physiology of the organism the sympathetic system serves primarily to maintain constancy of composition of the fluids of the body. This it achieves through control over the heart, blood-vessels, sweat glands and other vegetative functions, and it is not surprising therefore that recent work has failed to confirm the early suspicion that the sympathetic also governed certain phases of muscular contraction. There is no doubt but that ramisection causes transient modification in postural contraction, but no reflex involving the skeletal musculature is ever destroyed as a result of interference with the sympathetic. Consequently, since the alterations in postural reflexes are short lived, there is no obvious justification physiologically for ramisection in cases of spastic paralysis.

Ischaemia is the chief physiological indication for ramisection. Any pathological process in which healing would be accelerated by hyperaemia is an indication for the operation, especially if the process threatens an extremity. It is probable that following thrombosis in an extremity, collateral circulation is established more readily after vasoconstrictors have been removed than when they are intact.

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The preceding address was written before White's[19] most useful review on the surgery of the sympathetic appeared in this journal. As he has given a full bibliography of recent clinical literature these references will not be repeated here.

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Abstracts of Papers Read at the Symposium on the Surgery of the Sympathetic Nervous System Held at the Meeting of the British Medical Association, Winnipeg, August 29, 1930.

Dr. W. J. Mayo (Rochester, Minnesota) opened the discussion with a general paper in which he gave an historical account of the anatomy and physiology of the sympathetic system, mentioning the contributions of Winslow, Pourfour du Petit, Müller, Remak, Claude Bernard, Gaskell and Langley. He pointed out that the surgery of the autonomic system involved the wider problem of the relation of this system to the endocrine glands, especially to the thyroid and adrenals. Dr. Mayo does not believe that removal of a single adrenal causes any permanent disturbance in the physiology of the organism, and he therefore questions the wisdom of unilateral adrenalectomy in patients suffering from high blood pressure. In closing he referred to the effect of ramisection on conditions such as arthritis, Raynaud's disease, and the Buerger syndrome, and asked whether the arteriosclerotic kidney and coronary disease may not be an end-result of a similar vasospastic process, and whether early sympathectomy in such conditions might not prevent the onset of these and allied disturbances.

Dr. J. F. Fulton (Yale). The full text of Dr. Fulton's paper is given above.

Dr. N. D. Royle (Sydney, Australia) then followed with a paper entitled "The clinical results following the operation of sympathetic ramisection", in which he stated that he had performed the operation 600 times, in approximately 300 different patients, with an operative mortality rate of .5%, i.e., 3 deaths. The operation was introduced by him originally in October, 1923, for the treatment of spastic paralysis, and if one excludes extrapyramidal conditions, 70% of the patients so treated have been distinctly benefited. A large proportion of them have been followed carefully and end-results are summarized. Some 12 patients who had never been able to stand unassisted were able, after ramisection, to walk for the first time in their lives. More recently, Dr. Royle has used the operation experimentally for treatment of the following conditions:

Parkinsonian rigidity (results poor)
Hirschsprung's disease (results excellent in all cases)
Sarcoma of the femur (one case; relief of pain)
Raynaud's and Buerger's diseases (results gratifying, better, however, in the former condition)
Writer's cramp (one case, relief)
Poliomyelitis (results poor)
Condition simulating tic douleureux (one case)
Retinitis pigmentosa (five cases; recovery of vision following extirpation of thoracic and cervical sympathetic)

The most important new development relates to Dr. Royle's discovery that retinitis pigmentosa responds to sympathectomy to a degree that caused the recovery of 20/30 vision in one patient whose visual acuity had previously been reduced to shadow perception. Royle still enthusiastically favours the operation of ramisection in cases of spastic paralysis.

Dr. J. R. Learmonth (Rochester, Minnesota) emphasized that the action of both parasympathetic and sympathetic nerves upon the bowel and bladder should be regarded as a means of harmonizing an important physiological necessity—the disposal of the waste products of the body. Operations upon the sympathetic nerves of the bowel are indicated in cases of nervous imbalance, such as Hirschsprung's disease, and constipation due to dulling of the defaecation

reflex. He described the innervation of the viscera and gave full details concerning a new operation by which the whole sympathetic nerve supply to the lower colon, the rectum, and the internal anal sphincter could be interrupted, with preservation of the vasoconstrictor fibres to the limbs. In the case of the bladder, he described two cases in which defective micturition, due to lesions affecting the parasympathetic pathway, had been rectified by division of the sympathetic nerves to the bladder, and he advanced the hypothesis that these nerves might mediate an inhibitory action on the musculature of the human bladder. He also mentioned several cases of vesical dysfunction which had been benefited by removal of agents compressing the dural sac under a lumbar or sacral spina bifida occulta. The operation of total denervation of the bladder was also referred to and the indications for performing it discussed.

Dr. R. B. Wade (Sydney, Australia) gave a most encouraging report of progress concerning the treatment of Hirschsprung's disease. He has now carried out left-sided lumbar ramisections for this condition in 14 cases, and has had striking improvement in all but one instance, with the establishment of regular bowel movements and normal control of the anal sphincter. The unsuccessful case responded temporarily, however, when the rami on the right side also were sectioned. The unilateral operation has been employed in many cases of chronic constipation also with satisfying results. Following ramisection, several months usually elapse in cases of Hirschsprung's disease before the tone of the bowel is reëstablished. Dr. Wade believes that the condition is caused by hyperactivity of the sympathetic system and the resulting closure of O'Beirne's sphincter.

In Dr. W. Penfield's (Montreal) paper, "Vascular changes observed in the brain during epileptiform seizures" he mentioned at the outset that he had been able to demonstrate small medullated nerve fibres supplying a large proportion of the cerebral blood vessels; three cases of epilepsy were then described in which, during exposure of the brain under local anaesthesia, sharply circumscribed areas of anaemia appeared at several points in and about the motor area in the course of several carefully studied focal seizures. In the second case, one of the recorded seizures consisted merely of clonic twitching of the eyelids and turning of the eyes to the right, and the seizure was associated with an isolated patch of chalky pallor in an area corresponding to the frontal eye field of the cortex. In some circumstances the larger cerebral arteries were seen at several points to constrict sharply, giving a beaded appearance to the whole vessel. Dr. Penfield pointed out that, on anatomical grounds, the cerebral vessels receive some innervation other than sympathetic, and that therefore surgical extirpation of the sympathetic chain in epilepsy should be considered a purely experimental procedure.

A. W. Adson (Rochester, Minnesota), who dealt with the "Indications for, and the therapeutic value of, sympathetic ganglionectomy and trunk resection in the treatment of peripheral vascular diseases," mentioned the two existing theories concerning the origin of Raynaud's diseases, one, upheld by Lewis, who maintains that the vascular spasm is due to a purely local condition in the tissues affected, while Adson and others contend that the condition results from hyperactivity of vasoconstrictor reflexes, and that the fault therefore lies in the central nervous system. Adson pointed out that in his cases, after complete removal of the vasoconstrictor's supplying the lower limb, it is impossible to evoke vasomotor spasm, however intense the stimulus. The occasional persistence of spasm in the upper extremities was attributed to failure to remove all fibres. The more favourable results from the radical procedure recently introduced for the upper extremity supports this inference. At the Mayo Clinic the suitability of a case for operation is determined by "vasomotor index", i.e., the ratio of the rise of temperature in the extremities to that in the mouth in fever produced by injection of typhoid vaccine. Adson also has proved that retinal arteries dilate after thoracocervical ramisection. In concluding, Dr. Adson showed his first case of Raynaud's disease operated on five years ago, which had remained free of symptoms during that period (lower extremities), and also a case of Buerger's disease in which the morbid process had been successfully arrested in the upper extremities two years previously.

After the formal papers had ended, Lord Moynihan read in title a paper by S. H. Harris, and R. G. S. Harris, of the Urological Department of the Lewisham Hospital, Sydney, on "Renal Sympathetico-tonus and Renal Sympathectomy." The operation which they described was introduced in the hope of relieving certain obscure cases of persistent renal pain. The paper details the nerve supply of the kidney, the operative technique for denervation of the kidney, and it describes in detail the indications for the new procedure. Pain associated with delayed emptying of the renal calices and pelvis, together with dilatation of the pelvis constitute the chief positive signs. The writers propose to consider at a later time the relation of this operation to nephritis and essential haematuria.

Dr. Robertson (Toronto) described a case of spastic paralysis operated on in his clinic by Royle, three years ago, in which the result was distinctly favorable and has remained so. He also mentioned several cases of arthritis and of Hirschsprung's disease which had been successfully treated by ramisection.

DR. P. G. FLOTHOW (Seattle) said that he had seen Dr. Royle's cases in Australia and could confirm his claims. He then described a case in which, some months after lumbar ramisection, a cervical ganglionectomy had been performed, and, during the hyperthermia (108°) which followed the second operation, the lower extremity, whose lumbar sympathetic chain had been removed, showed evidence of extreme vasoconstriction.

In a particularly happy speech, LORD MOYNIHAN, the Chairman of the Section, after warmly congratulating Dr. Royle upon the new movement which he had set in motion, drew attention to the high level of the discussion and pointed out its relationship to the development of surgery in the past fifty years. Following upon the revolution affected by the work of Lister, surgeons had concerned themselves with the restoration of mechanical disorders by mechanical means. Surgery now is entering upon a new era, which might aptly be termed an era of physiological repair. The wedge which had been driven between physiology and anatomy at the close of the career of Sharpey, the last of the "Giants," had been unfortunate and its ill effects had persisted up to the present time. Lord Moynihan, however, seemed to discern the restoring hand of the surgeon. The synthetic action of surgeons begun by Dr. Royle was bringing physiology and anatomy together again, not by means of animal physiology, but by means of *human* physiology. The inaugural symptoms of disease should be studied by those who were cognizant with normal physiology rather than with the pathology of the postmortem room.

For the philosopher this was the lesson offered by today's meeting, and Lord Moynihan ventured to predict that if physiology were to advance in the near future, it would do so by associating itself more intimately with the wards and with the operation theatre.

J. F. F.

AN ANALYSIS OF THE CASES OF INFANTILE PARALYSIS TREATED AT THE SHRINERS' HOSPITAL FOR CRIPPLED CHILDREN, SPRINGFIELD, MASS., DURING 1925

BY R. NELSON HATT, M.D.,* AND GARRY DE N. HOUGH, JR., M.D.*

THIS study consists of an analysis of 116 cases of anterior poliomyelitis in children, treated at the Shriners' Hospital for Crippled Children, from its opening, February 21, 1925 to March 31, 1926, with particular attention to the follow-up result after a period of four years.

Ninety-six children requiring operative procedure, or whose residence at a distance from Springfield made frequent visits impracticable, were admitted to the Hospital, while twenty were treated as out-patients.

All cases were subjected to the usual requirements for admission to the Shriners' Hospital for Crippled Children throughout this country and Canada, namely that the child be less than 15 years of age, of normal mentality, suffering from an orthopedic condition capable of improvement, and unable to pay for treatment. In regard to the third restriction, no child with infantile paralysis has been refused treatment as incapable of improvement, as it is our opinion that all such patients should have the benefit of continued observation and training, at least through the period of rapid growth. These children are admitted to the Hospital on the recommendation of a Shriner who investigates the financial condition, and sends in this report with that of a medical examination by the family physician. The children come from all over New England and eastern New York, with a few of this series from farther South.

The following data have been studied:

(1) From the history: the age at onset, the original involvement, the immediate or previous treatment.

(2) From the admission note: the age at admission, duration of paralysis, muscular involvement, deformity, and function.

(3) The treatment employed: mechanical, physiotherapeutic, or surgical.

(4) The results obtained as to deformity and function at discharge and at follow-up observation grouped according to the treatment.

AGE AT ONSET

The age at onset was recorded in 111 cases. In 3 cases of paralytic scoliosis there was no definite knowledge of the acute onset and two histories were incomplete.

It is well known that the disease may occur at any age from early infancy to late adult life, but as the name "infantile paralysis" implies, it is more common in early childhood. In this series, as shown in Table I, more than half the cases had the disease before their third birthday; in 84% the onset was before the age of 5 years; and in 93% before 8 years.

ORIGINAL INVOLVEMENT

The gross extent of the original involvement in 38 cases showed 52 legs involved, 22 arms,

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and 7 with trunk impairment, including 3 with indefinite acute history who developed scoliosis. The nature of the original distribution is shown in Tables II and III which agrees with the usual findings that while any group of muscles may be affected, the legs are more commonly involved than the arms, and there is a slightly greater involvement of the right than the left.

TABLE I

AGE AT ONSET

Age	No. of Cases	Total	Per Cent.
3 mos.	2		
5½ mos.	1		
6 mos.	3		
8 mos.	4		
9 mos.	2		
Less than 1 yr.	1	13	12
1 yr.	16		
14 mos.	2		
15 mos.	1		
1½ yrs.	11	30	27
2 yrs.	15		
2½ yrs.	1		
2 2/3 yrs.	1	17	15
3 yrs.	20		
3½ yrs.	1	21	19
4 yrs.	12	12	11
5 yrs.	2		
6 yrs.	7		
Less than 8 yrs.	1	10	9
8 yrs.	3		
9 yrs.	1		
10 yrs.	1		
11 yrs.	1		
12½ yrs.	2	8	7

TABLE II

Involvement	Cases	Per Cent.
Both legs	16	42
Right leg	3	8
Left leg	2	5
Hemiplegia:		
Right	1	3
Right and trunk	1	3
Left and trunk	1	3
Both arms	1	3
Right arm	1	3
Left arm	3	8
All extremities	3	8
All extremities and trunk	2	5
Right arm and both legs	1	3
Trunk alone	3	8

TABLE III

	Right	Left	Total	%
Legs	27	25	52	64
Arms	12	10	22	27
Trunk	—	—	7	9
	—	—	—	
	39	35	81	

IMMEDIATE OR PREVIOUS TREATMENT

In only 53 of the 116 cases was a history of definite treatment obtained and while possibly some others had efficient therapy, fully 50% of the total series had never received any orthopedic treatment.

Twelve cases, or 10%, had been under the care of a recognized orthopedic surgeon or clinic.

Ten cases, or 9%, had immediate immobilization of the affected part, and one other case had immobilization one year after onset.

Massage was used in 26 cases, or 22%, but in 13 of these it was the only treatment, used without skilled supervision, and of questionable efficiency.

Braces were worn at some time by 32 of the patients, or 28%, but had been discarded, worn intermittently, or outgrown in practically all cases.

Operations had been performed in 7 cases, or 6%. In one case there had been 7 operative procedures, and in another there had been 3.

It is of great interest and considerable significance, in view of the relative proximity to high-grade orthopedic centers, and the number and efficiency of available charitable agencies, that practically none of these children had received any continued treatment, and that the great majority had been grossly neglected.

TABLE IV

AGE AT ADMISSION

Age	Cases	%
14 months	1	0.8
2 years	4	3.5
3 "	7	6.1
4 "	4	3.5
5 "	4	3.5
6 "	9	7.9
7 "	4	3.5
8 "	7	6.1
9 "	10	8.8
10 "	11	9.7
11 "	15	13.3
12 "	13	11.5
13 "	12	10.6
14 "	8	7.0
15 "	3*	2.7
16 "	1*	0.8
1-5	20	17.7
6-10	41	36.3
11-16	52	46
1-8	40	35.4
8-16	73	64.6

*In these four cases an error was made in the age stated at admission.

AGE OF ADMISSION

The age when first seen varied from 14 mos. to 16 years, the number being slightly greater between 9 and 12 years. It is interesting to note that the children of this age group were at their most susceptible age in 1916, the date of the last extensive epidemic in this vicinity.

DURATION OF PARALYSIS

Comparison of Tables I and IV shows that in most cases the paralysis had been of several years' duration. Analysis of the individual cases shows that in the total of 113 cases, the duration was unknown in 2 cases. Six cases (5.3%) were in the subacute stage, with a duration of under six months. Five more cases were in the convalescent stage with less than 2 years' duration, while the remainder varied from 2 to 14 years. Table V shows the actual duration.

TABLE V

Duration	No. of Cases	%
2 months	2	1.7
4 "	1	0.8
6 "	3	2.7
1 year	5	4.4
2 years	13	11.5
3 "	9	7.9
4 "	13	11.5
5 "	6	5.3
6 "	1	0.8
7 "	4	3.5
8 "	16	14.1
9 "	17	15.0
10 "	7	6.1
11 "	3	2.7
12 "	7	6.1
13 "	2	1.7
14 "	2	1.7
Unknown	2	1.7

MUSCULAR INVOLVEMENT

The cases of this series show the usual predominance of lower extremity paralysis. Of 111 patients with complete muscle tests, 15 showed involvement of some muscle of the upper extremity, 32 had abdominal involvement and 103 showed paralysis in one or both legs.

ARM INVOLVEMENT

Six patients with arm involvement had no other muscles affected, while in nine the arm involvement was associated with leg paralysis. In 5 cases the arm paralysis was slight, showing in one case general atrophy without definite impairment, in another a complete loss of one opponens pollicis, and in three cases involvement of both triceps.

The remaining 10 cases were unilateral in all except one case, which presented practically complete paralysis of the right arm and extensive loss in the left shoulder. In the 11 involved extremities, one was completely flail, one flail except slight power in flexor sublimis digitorum, and two showed extensive loss in the hand. The remainder presented more or less diffuse involvement of the shoulder and arm.

ABDOMINAL INVOLVEMENT AND SCOLIOSIS

Thirty house patients and two out-patients, or 28%, showed involvement of the abdominal muscles. Twelve patients showed a unilateral involvement, the right side being involved in 5 instances and the left in 7. The involved muscles were fair in 8 cases, poor in 3, and absent in one. There was imbalance with some involvement of both sides in 10 cases, of which the right predominated in 8 and the left in two cases. One side was fair and the other poor in 4 cases, while the remaining 6 all varied as follows: one good, the other fair; one fair, the other trace; one poor, the other absent; one anterior poor, lateral good, the other side trace; one anterior poor, lateral good, the other side poor; and one anterior trace, lateral good, the other side poor. The remaining 10 patients had some bilateral involvement with no gross imbalance.

It is of interest to consider here the cases of scoliosis in relation to the involvement of the abdominal muscles. In this series there were seen 13 cases of scoliosis, or an incidence of 11%. In only 4 of these cases were the abdominal muscles not definitely imbalanced. These four patients had the following curves: a total left, a right lumbar, a left dorsal and right lumbar, and a right dorso-lumbar. The remaining nine patients with scoliosis all showed abdominal imbalance, representing 41% of all cases of abdominal imbalance and all had practically the same type of curve, namely: five left dorso-lumbar, two right dorso-lumbar, and two right dorsal left lumbar. In four of the five left curves the predominance was on the right; in one the left side was stronger. Of the four right curves the left abdominal predominated in three, and the right in one. It is reasonable to conclude from these observations that abdominal imbalance is an important causative factor in some cases of paralytic scoliosis, but is not the sole cause; and that with the abdominal imbalance, there is approximately an even chance of developing a dorso-lumbar curve contralateral to the stronger muscle.

LEG INVOLVEMENT

Of the 111 cases with muscle tests, in 103 cases, or 93%, there was involvement of one or both legs. The amount of paralysis varied from slight to extreme. The more severe cases showed: two completely flail extremities in one case; and total paralysis except for a trace in toe flexors in one case; poor abductor and poor toe flexors in another; a good calf; fair hip flexors, extensors and hamstrings; poor flexors, trace in abductors and adductors; poor flexors, good extensors, fair abductors and trace in adductors; poor flexors and poor adductors; trace in flexors and adductors with poor abductors; and one with trace in abductors, adductors, calf and toe extensors. Practically, from the viewpoint of function, these 11 extremities may all be considered as flail legs.

Twenty house patients and three out-patients (21%) showed flail or practically flail hips. In those showing any power, the flexors were some-

what stronger. Forty-nine house patients and 7 out-patients (51%) had flail knees; while 70 house patients and 7 out-patients (70%) had practically flail or grossly imbalanced feet.

DEFORMITY

Of the total 116 patients, 102, or 89%, showed one or more deformities. Four of the house patients and ten of the out-patients had no deformities. Of the four house cases 3 were cases of arm paralysis and one was an acute case.

Thirty-seven patients presented a single deformity and seven a simple bilateral deformity. Thirty patients had a combination of simple deformities in one or both legs, and eleven had scoliosis with deformities of one or both legs.

Of the 37 single deformities 30 were foot deformities, 3 were flexed knees and four were scoliosis. The foot deformities were divided into all possible types, as follows:

Deformity	Cases	
Equinus	1	
Equino-cavus	2	
Equino-valgus	5	13
Equino-varus	2	
Equino-valgus-cavus	2	
Equino-varus-cavus	1	
Calcaneus	2	
Calcaneo-cavus	1	11
Calcaneo-valgus	7	
Calcaneo-varus	1	
Cavus	3	
Cavo-varus	1	
Varus	1	
Valgus	1	

The combined deformities show irregular distribution of 234 elements of deformity, of which 97 were in the foot, 86 in the knee, 34 in the hip, 11 in the spine, 5 in the elbow and one in the wrist.

The deformities found are shown in Table VI.

TABLE VI

Site	Deformity	Cases		Per Cent.	
Wrist	Hyperextension	1		0.4	
Elbow	Flexion	5		2	
Spine	Lateral curvature	15		6	
Hip	Dislocation	1		0.4	
	Flexion	33	34	14	14.4
Knee	Flexion	27		12	
	Knock-knee	36	86	15	37
	Tibial torsion	19		8	
	Recurvatum	4		2	
Foot	Equinus	9		4	
	Equino-cavus	4		2	
	" -valgus	37	80	15	34
	" -varus	25		11	
	" -valgus-cavus	3		1.2	
	" -varus-cavus	2		0.8	
	Calcaneus	3		1.2	
	Calcaneo-cavus	2		0.8	
	" -valgus	16	25	6	9.6
	" -varus	2		0.8	
	" -valgus-cavus	1		0.4	
	" -varus-cavus	1		0.4	
	Cavus	6		2.4	
	Cavo-varus	2		0.8	
	Varus	7		3	
	Valgus	8		3.4	

Analysis of elements of foot deformities shows the following:

Equinus	80 cases	39%
Calcaneus	25 "	11%
Cavus	21 "	10%
Valgus	65 "	28%
Varus	39 "	17%

FUNCTION

The function on admission is recorded in 108 cases. In three cases it is merely noted that there is poor function and in three others the function is recorded as good. The remaining 101 have more definite notes. In the involvement of the upper extremities there were 4 flail shoulders and one flail arm. In 98 cases there was disturbance of locomotion, among which are included 3 hand walkers. These cases are classified as follows:

	Cases	%
1) Unable to stand	3	3
2) Unable to stand without braces and crutches	3	3
3) Unable to stand without braces	1	1
4) Unable to walk	11	11
5) Walks with braces and crutches	6	6
6) Walks with crutches	13	14
7) Walks with one crutch	2	2
8) Walks with brace	0	0
9) Walks with limp	59	60
a. Extreme limp	2	
b. Marked limp	26	
c. Moderate limp	14	
d. Slight limp	11	
e. Not qualified	6	

TREATMENT

The methods of treatment utilized in these cases consisted of a combination of three types as follows: (1) surgical procedures designed to correct deformity or improve function: (2) physiotherapy, consisting of baking, massage, and muscle training; and (3) apparatus to protect or to improve function.

Of the 20 out-patients three had surgical procedures, namely, a stretching plaster for knee flexion; a bilateral plantar fasciotomy with plaster fixation for mild cavus; and one patient with scoliosis, having passed the age limit after preliminary jacket correction, was admitted to another hospital for spine fusion. Six out-patient cases have notes in regard to physiotherapy. None was given in two cases; home exercises were taught in two; and treatments were advised but not followed in two cases. Apparatus was used in the care of 10 cases, consisting of felt and leather pads, in 2 cases; a leather jacket; a long hip splint; one plain caliper; and one a caliper with sole plate.

More difficulty was encountered in following these cases than those which were hospitalized, coöperation not being stimulated by the dramatic effect of surgical procedures. Seven pa-

tients, or 35%, were lost in less than one year. Of the 13 patients followed, 3 (23%) showed slight improvement as indicated by muscle tests but not sufficient to make any definite functional difference; four patients (31%) were materially improved, including the three operative cases mentioned above; five patients (38%) were unchanged during 3 years, and one became worse. In three of these cases it was never possible to secure any coöperation on the part of the child or parent in carrying out home exercises. The patient who became worse had the remarkable complication of a slowly progressing superimposed pseudohypertrophic muscular dystrophy. In 11 out-patient cases there was one deformity corrected, a flexed knee extended by wedging plasters; 5 patients had no deformity, and 5 had a deformity which was unchanged. Function in these cases was unchanged in 8, and improved in 2, while change is uncertain in one case, the last note stating that "the child gets about well."

Of the 96 house patients, 12 received no operation. The remaining 84 patients had 194 operations, or an average of 2.3 per patient. The main types of procedures employed in their order of frequency were: arthrodeses (35%), tendon transfers (23%), fasciotomies (18%), osteotomies (12%), and other tendon procedures (7%). The number of cases of each operation are given in Table VII.

TABLE VII

OPERATIONS

I	Arthrodeses	
	60	Stabilizations
	3	Arthrodesis of shoulder
	1	" talonavicular and scaphocuneiform
	1	Spine fusion
II	Tendon Transfers	
	19	Ext. long. dig. to dorsum
	2	" " hal. to metatarsal base
	2	" " hal. to ant. tib.
	1	" " dig. to ant. tib.
	1	" " hal. to navicular
	1	Peroneals and post. tib. to T. A.
	8	" to T. A.
	6	" to ant. tib.
	1	" to middle cuneiform
	1	Peroneus brevis to middle cuneiform
	1	Biceps to patella
	1	Abd. pol. to Flex. long. pol.
	1	Ext. carpi ulnaris to Flex. sublimis.
III	Fasciotomies	
	3	Steindler fasciotomy
	14	Division of iliotibial tract
	13	Hip fasciotomy
	5	Plantar fasciotomy
IV	Osteotomies	
	2	Supracondylar
	22	Tibial
V	Other Tendon Procedures	
	1	Reefing flexor carpi ulnaris
	2	Tenotomy
		1 Tendo achillis
		1 Hamstrings
	11	Tendon lengthening of tendo achillis
VI	Miscellaneous	
	1	Hip plastic
	1	Hip open reduction
	4	Stretching plasters
	3	Talonavicular arthrotomy

Physiotherapy in House Cases

Some physiotherapy was employed in 55 of the 96 cases, or 57%, while these patients were in the hospital. In 25 cases, or 26%, the duration of muscle training was less than two weeks, which is barely sufficient to teach the child a set of exercises for home use. In 30 cases, or 31%, there was intensive supervised muscle training, over a period varying from 3 weeks to one year, as shown in Table VIII. Some patients showed definite improvement in function, while others recovered little or no power.

TABLE VIII

PHYSIOTHERAPY

None	41
1 Week	13
2 Weeks	12
3 Weeks	1
4 Weeks	1
1 Month	3
5 Weeks	1
6 Weeks	5
2 Months	3
10 Weeks	3
3 Months	4
15 Weeks	1
4 Months	3
5 Months	2
6 Months	2
1 Year	1
	96

Preoperative 4 months in 2 cases

Braces

Of the 96 house cases 19 patients, or 20%, were discharged with no fixation; 30 patients (31%) had plaster casings, including one plaster jacket, and 47 (49%) had apparatus. Ten patients had shoe adjustments; in 3 combined with other apparatus, while it was the only type of support used in 7; 12 children had combinations of 2 pieces of apparatus, and 6 had three types, including crutches. A total of 74 pieces of apparatus was used. The single pieces of apparatus used were:

7 Simple calipers
6 Jointed calipers
3 Thomas ring calipers
2 Thomas ring calipers with eccentric knee-joint
1 Simple caliper with eccentric knee-joint
1 Double upright with foot piece
2 Aeroplane arm splints

Two pieces:

Thomas ring caliper and leather jacket
Thomas ring caliper and crutches
Thomas ring caliper and jointed caliper

Caliper and leather jacket
Pair of calipers—5 cases
Pair of calipers with pelvic band
Pair of jointed calipers—2 cases

Three pieces:

Thomas ring caliper with KK strap, caliper with inside T-strap and webbing belt
Thomas ring caliper, Goldthwait back brace, and crutches
Jointed Thomas ring, leather jacket, and crutches
Jointed Thomas ring (pair), and crutches
Jointed calipers (pair), Goldthwait back brace
Jointed caliper with KK strap and outside T-strap, leather jacket and crutches

Table IX gives the total apparatus used:

TABLE IX

5 Pair of crutches
10 Shoe adjustments — 6 raised heels — 1 Thomas heels—3 felt and leather pads
19 Simple calipers — 14 jointed calipers — 1 pair of calipers with pelvic band — 1 caliper with eccentric knee
8 Thomas ring calipers
3 Jointed ring calipers
2 Jointed ring calipers with eccentric knee
4 Leather jackets
2 Goldthwait back brace
1 Webbing belt
1 Double upright with foot piece
2 Aeroplane arm splints

IMMEDIATE RESULTS

The immediate result is estimated in regard to deformity and function, at time of discharge.

The deformity in the 96 house cases was completely corrected in 71 cases, or 74%. Four patients had no deformity, one patient left against advice without a final note and one case is without record. The remaining 19 cases or 20% represent some degree of failure of perfect correction. Three cases were unchanged. Five cases of scoliosis were satisfactorily, but not completely corrected. Three cases were largely corrected, including one case in which some equinus was intentionally left to stabilize a weak knee. In eight feet the deformity was not perfectly corrected. Three of these were originally varus feet and five were in valgus. One of the varus feet had a talonavicular arthrotomy with partial correction, but some varus persisting. One foot with equino-valgus was manipulated but the patient was discharged with the foot in some valgus. Two varus feet, one stabilized and one manipulated, were left with some valgus. One valgus foot was partially corrected by manipulation. In explanation we would state our belief that slight valgus is functionally preferable to slight varus.

In regard to function, forty-six, or 48%, were improved, while fifty, or 51%, were the same, including one patient, who left against advice without treatment, and thirty patients discharged in plaster. An analysis of the improvement showed one child, previously unable to stand, could stand with a brace; thirteen previously unable to walk, could walk on discharge. Twenty-one patients used crutches on admission, and five used crutches on discharge. Ten patients were wearing braces on admission, while forty-seven had braces and thirty were wearing plaster at time of discharge. Since freeing a patient of apparatus is a frequent objective of surgical treatment, this increase appears surprising, but in many cases the braces were definitely temporary, while many others should have been wearing braces on admission.

FOLLOW-UP RESULTS

In presenting the follow-up results the non-operative cases will be considered as a group and each type of operative procedure will be considered separately. Where two or more operations have been performed on a single case, the case will appear under each procedure with an attempt to evaluate the benefit of the operation under consideration.

Agreeing with Dr. E. A. Codman that "to effect improvement the first step is to admit and record our lack of perfection", we have endeavored to be hypercritical in all our estimates.

Results have been classified as "good" only when complete correction of all deformity has been maintained for three or four years, and there has been definite functional improvement.

Results have been considered "fair" if there has been even the slightest amount of residual or recurrent deformity, associated with definite improvement in function.

Non-operative Cases

This group is made up of 12 cases, 2 of which have been observed for 3 years since discharge, and 6 for 4 years. Three patients were admitted in the subacute stage, at two months after onset in two cases and four months in the third. Three patients were under 3 years of age, two being 2½ and one 3. Two patients showed extensive paralysis without deformity, and were admitted for the application of braces. The acute cases have all been made ambulatory with apparatus, and two patients show some slight continued improvement in muscle power, even after three years. One patient developed slight equino-varus and knock-knee after two years. These patients were aged 1, 8, and 12 years.

The three babies all showed deformity on admission, which was corrected by plaster and stretching. The duration of paralysis in these cases was 8 months, one year, and two years. The deformities corrected were scoliosis; hip flexion, two of 30 and one of 45 degrees; valgus, equino-varus (two); and varus. Braces were applied in all cases, and discontinued at three years in one case. Slight improvement in muscle power was obtained in two cases, none in one. The patient who did not improve in muscle power retained correction of deformity. The scoliosis recurred slightly but has remained stationary

with support for two years; valgus recurred at three years. The 45 degree hip flexion and varus recurred in one year, when the child was readmitted for a hip fasciotomy and division of the ilio-tibial tract. Slight deformity again recurred during the next year, but was corrected by stretching.

STRETCHING PLASTERS

Four cases of knee flexion deformity of 30 degrees or more were corrected by stretching plasters. In three cases the paralysis was of long duration, being 8, 8, and 13 years, while in the fourth case it was only 6 months. The deformity has remained corrected for four years in three cases, while in the other case, 20 degree flexion was noted at two years, and 30 degrees at three years. The method of correction consisted of applying a well-fitted long leg plaster casing, padded with felt under the heel and thigh and over the patella. This plaster was divided horizontally behind and slightly above the knee joint, and extension obtained by wedging with wooden tongue depressors, or an extension screw of the type described by Flagstadt.

Foot Stabilization

This was the most common operative procedure, being done sixty times. It was the only operation in thirteen cases, was combined with some concomitant procedure in fifteen cases, and was one of the two or more operative procedures in the remaining thirty-two cases. We will consider the cases in these three groups.

The type of operation used was that devised by Hoke, and his technique as described in 1921 was closely followed. Particular attention is paid to the accurate alignment of the foot and adequate posterior displacement of the os calcis under the talus, particularly in calcaneous feet. After satisfactory position has been secured, it is maintained by the operating surgeon, standing at the foot of the operating table, while the wound is sutured, dressed, and plaster applied, by the assistant.

Stabilization Alone

In this group of thirteen cases, the age at operation varied from 5 to 14 years, being 5, 6 (two), 8, 10, 11 (five), 12, 13, and 14. The duration of paralysis was from 2 to 13 years,—being 2, 3 (four), 4, 5, 8, 9 (two), 12, and 13. The deformities were calcaneous in one, calcaneovarus in one, calcaneovalgus in two, equinovarus in two, equinovalgus in three, and varus in three. One case was lost on discharge, and two after 2 years. Six patients have been seen three years after operation, and four have been followed for four years. Complete correction of deformity after four years was present in seven cases, and two years in one case, in one of which, however, a secondary manipulation and osteotomy was required after one year to correct some recurrent varus; this must, therefore, be classed as a failure. Of the four imperfect cases, two showed some valgus, one slight varus, and one some calcaneus and very slight varus. All these feet were stable, symptomless, and functionally improved. Before operation one was using braces and crutches, and still requires them, and one on crutches now uses a brace and crutch. Five had a marked limp preoperatively; in one it is still marked, in three moderate with a brace, and in one it is slight. In three with moderate limp it has been reduced to slight.

Cases	13	Lost	1	7.6%
		Good results	7	54 %
		Fair results	4	30.8%
		Failure	1	7.6%

Stabilization with Concomitant Tendon Work

In fifteen cases the stabilizing procedure was combined with some type of tendon transfer or lengthening. This consisted of lengthening the tendo-achillis and transfer of toe extensors to dorsum in one case; tendon lengthening in one; peroneus brevis to dorsum in one; and toe extensors to dorsum in seven, in one of which the extensor hallucis was also inserted into the anterior tibial. These cases are considered subsequently under the particular type of tendon work, but are analysed separately here because of the possible influence of the additional procedure on the result of the stabilization.

The age at operation varied from 4 to 12 years, being 4, 6 (two), 8 (two), 9 (four), 10, 11, 12 (four). The duration of paralysis varied from 3 to 11 years, being 3, 4 (four), 7, 8 (seven), and 11 (two). The deformities were calcaneo-valgus in two, equino-varus in two, and equino-valgus in the remaining eleven cases. One case was lost at the end of one year, and one after two years, at which time the deformities were completely corrected. Five patients maintained complete correction for four years. Eight patients showed some deformity, five having slight valgus, two slight varus, and one, clawing of toes.

There was considerable functional improvement with good stable feet in all cases. Three patients before operation used braces and crutches, one of these was made crutch-free; the other two still require crutches. One child was unable to walk before operation and now gets about well with a marked limp. A marked limp was reduced to moderate in four cases and to slight in one. A moderate limp was eliminated in one case, and made slight in another. A slight limp persisted in two cases although definitely improved. Two patients were noted merely as functionally improved at one year after operation.

Cases	15	Lost	2	13.3%
		Good results	5	33.3%
		Fair results	8	53.3%

Stabilizations with Other Procedures

The third group of stabilizations in which this operation was one of two or more procedures is

the largest group, being made up of 24 cases with 29 stabilizations. The age at operation varied from 5 to 14 years, being 5, 6 (four), 7, 8 (three), 9 (three), 10 (three), 11 (eight), 12 (four), 13, and 14 (three).

The duration of paralysis varied from 2 to 12 years, being 2 (four), 3 (two), 4, 5 (six), 6, 7 (three), 8 (four), 9 (seven), 10, and 12 (two). The deformity present was equinus in two, calcaneus in two, varus in two, valgus in one, calcaneo-valgus in four, calcaneo-cavus in one, calcaneo-varus on one, equino-valgus in seven, and equino-varus in twelve.

One case with two operations was lost to follow-up, one was followed only one year, five cases with six operations were lost track of after two years, and three after three years. The remaining 14 cases with 17 operations have all been seen four years after operation. The patient lost at one year had maintained correction, was stable, and showed functional improvement. A marked limp was made moderate. The patients followed two years showed no deformity in five cases, and slight valgus in one. All were stable and functionally improved. Two were unable to walk on admission, and when last seen were getting about with moderate limp with braces, and in another case the limp was improved from marked to moderate.

Of the twenty feet seen three or four years following operation, twelve showed no deformity, five showed slight deformity and three had definite deformity requiring secondary surgical correction. The slight deformities consisted of slight varus in two, slight cavus, slight calcaneus, and fore-foot pronation in one case each. The three definite failures were a recurrent varus in a case of equino-varus requiring a wedge resection, and two cases of secondary deformity of the fore-foot with rotation of the first metatarsal in calcaneo-cavus and calcaneo-varus feet, which were corrected by arthrodesing the metatarso-cuneiform articulation.

In all cases good stability was secured, and improvement in gait was observed in all cases except the three patients with secondary deformities who were readmitted; two of these were recorded as moderate limp on admission and at three years, while one was slight, both before and after. Seven patients required braces and crutches before operation, and three still require them, but in two instances progression is markedly improved. Three wear braces, and the seventh walks with marked limp. Of six patients who had a marked limp on admission, three are now classed as moderate, and three as slight. In two with moderate limps, one has now a normal gait and the other slight.

Cases	29	Lost	9
		Good results	12
		Fair results	5
		Failures	3

All Stabilizations

Combining the three groups (60 cases), we find the age at operation varying from 4 to 14 years as follows: 4, 5 (two), 6 (eight), 7, 8 (six), 9 (seven), 10 (five), 11 (fourteen), 12 (nine), 13 (two), and 14 (four).

The duration of paralysis was from 2 to 13 years, being 2 (five), 3 (seven), 4 (six), 5 (seven), 6, 7 (four), 8 (twelve), 9 (nine), 10, 11 (two), 12, (three), and 13.

The deformities were calcaneus, three, calcaneo-cavus one, calcaneo-valgus eight, and calcaneo-varus two; equinus two, equino-valgus twenty-one, and equino-varus sixteen; valgus one, and varus five.

The success of following the 57 cases was as follows: lost soon after discharge 3 cases; followed for one year 2 cases; for two years 9 cases; for three years 9 cases; and for four years 34 cases. Of the patients observed within less than 3 years, one showed slight varus at one year, and one slight valgus at 2 years; while the others were good when last seen.

After three years, there was complete correction in 24 cases (53%), slight deformity in 17 cases (38%), and 4 patients (9%) developed secondary deformity requiring correction. The slight deformities consisted of valgus in 7, varus in 5, calcaneus in 1; calcaneo-varus in 1, cavus in 1, claw toes in 1, and fore-foot pronation in 1. The severe deformities were varus in two, and fore-foot rotation in two.

The amount of functional gain will not be recapitulated, but there was some definite improvement in gait in 54 of the 57 cases, or 94%. In all cases good lateral stability was obtained.

Spine Fusion

One case of paralytic scoliosis with increasing deformity and gross imbalance was corrected in plaster, and fused by Hibbs technique. During the first year postoperative, there was a gradual increase of deformity. At eleven months the child was readmitted and the fused area was explored. A definite pseudarthrosis was found and fused. For three years since this second procedure, the curve has remained fixed, and the child is symptom-free with unrestricted activity. This is considered a technical failure.

Case	1
Failure	1

Talonavicular and scaphocuneiform arthrodesis

This was done in one case, combined with tendon transfer, to correct a rotation deformity of the fore-foot. At two years after operation the supination deformity had recurred, the transfer did not function and the arthrodesis had not held.

Case	1
Failure	1

Arthrodesis of Shoulder

This was done in three cases, one of which has been seen four years since operation, and the others three. The operative technique con-

sisted of exposing the joint and removing the cartilage from the glenoid and the head of the humerus. The denuded tip of the acromion process was broken off and inserted in contact with the base of the acromion and the humeral head. All have given excellent results and it is particularly interesting that functional improvement continued for three years after operation. A solid arthrodesis was obtained in all cases. Active abduction of the arm was obtained in all cases, but the definite amount was recorded in only two cases. The first patient had 70 degrees at one year, 80 degrees at two and at three. The second patient had 100 degrees at one year and 80 degrees at two, three and four. This case took about a year to obtain complete adduction.

Cases 3 Excellent results 3

TENDON TRANSFERS

Extensor Longus Digitorum and Hallucis to Dorsum

This transfer was down in 19 cases, in five of which it was the only procedure. In five cases it was combined with stabilization, in one case with stabilization and transfer of the extensor hallucis to the insertion of the anterior tibial; in one with stabilization and fasciotomy of hip, and in one with stabilization and tendon lengthening. In two cases a Steindler fasciotomy was done, on one a tendon lengthening of tendo-achillis, one tendon lengthening with plantar fasciotomy, and two other cases there were contralateral stabilizations.

The technique of the procedure consisted of isolating the tendons of the extensor longus digitorum and the extensor longus hallucis through two parallel incisions over the dorsum of the foot. The tendons are divided near their insertions and denuded of their peritenon. A bone tunnel is then drilled through the bases of the metatarsals or through the cuneiform, being varied toward the inner or the outer side, depending on whether an inverting or everting force is desired. An alligator action toothed forceps of the type used in bronchoscopic work is passed through the tunnel from the inner to the outer side of the foot, and the divided toe extensor tendons are drawn through. The same forceps, or a similar smaller pair, are then introduced in the opposite direction and the extensor longus hallucis tendon is drawn through from the inner to the outer side. With the foot held in full dorsiflexion, the tendons are held under moderate tension and sutured to each other with chromic gut on either side of the tunnel, the periosteum being closed over them. The wounds are then closed, and a plaster casing applied from the toes to the knee. The plaster is bivalved and active motion started in one month.

The age at operation in these cases was from 4 to 14 years, with one at 4 years; four at 6; two at 8; two at 9; one at 10; two at 11; two at 12; one at 13; and four at 14 years. The duration of paralysis varied from 3 to 14 years, with the average around 8 to 9 years.

The deformities present were equinus, valgus and cavus in some combination, except in one case of calcaneo-valgus in which subsequent stabilization was planned, but the patient left the hospital. This case will not be considered further. The remaining 18 cases showed a simple equinus in one, a cavus in one, equino-cavus in two, equino-cavo-valgus in one, and equino-valgus in the other 13. One case was lost on discharge; one in one year, four were followed two years, two for three years and ten for four years.

In seven children the gait was not described on admission, while twelve showed disability varying from quadruped progression to a slight limp; there being one quadruped, two with crutches, one with extreme limp, four with marked limp, three with moderate and one with slight. Four years after operation the gait was improved in all cases. The quadruped was enabled to walk with braces; both crutch patients were freed of crutches, one walking with moderate limp and one with brace. The extreme limp was improved to a moderate; the four marked were moderate in two, slight in one, and one was readmitted for further surgery. The moderate cases were made slight in two and normal in one. The slight limp persisted as a slight limp due to shortening.

Direct observation as to the power of transplant was made after four years in ten cases, eight of which were strong, one good and one fair. Three additional cases were recorded at the end of three years as strong.

The deformity was completely corrected at four years in eight cases; one patient showed some clawing of the toes, and one slight valgus. Of the four patients observed only 2 years, one showed moderate valgus, two had slight clawing of toes and the other was completely corrected. Two of the fourteen cases represented real failures so far as maintaining correction of deformity. In both cases increasing cavus and varus required stabilization after two years.

Cases	19
Lost	1
One year	1
Two years	4
Three years	3
Four years	11

Results

Excellent	8	42%
Good	5	27%
Failure	2	11%
Uncertain	4	20%

Extensor Longus Digitorum to Anterior Tibial

This procedure was done once in a stabilized valgus foot of a 12 year old child, with paralysis of nine years' duration. The child was walking with braces and crutches. At 3 years the transfer

was active, there was no deformity, and although the child still used braces and crutches, progression was easier.

Cases	1
Good result	1

Transfer of Extensor Longus Hallucis

This tendon was transferred in five cases, in four of which the extensor longus digitorum was too weak to be a possible transfer. In the fifth case this muscle was also transferred, but separately. In two cases the transfer was combined with stabilization, in the third the foot had previously been stabilized; while in the fourth case the foot was stabilized three years later. In one case a concomitant talonavicular arthrodesis was done. The tendon was implanted in the metatarsal base in two cases; into the insertion of the anterior tibial in two and to the navicular in one.

The age at operation was about 10 years, being 9, 10, 11 and two 12. The paralysis occurred early in all cases, being 8 months, two cases at one year, and one each at three and four. In all cases there was an equino-valgus deformity.

In no followed case did the transfer materially aid the function of the foot in any positive manner. One patient has no follow-up. One was good at one year; one had no function at two years. The fourth patient was weak at two years and had no function at three years, the foot being then stabilized. In one case the transfer was strong in a stabilized foot four years after operation, with the foot in slight valgus, braces and crutches having been discarded.

Cases	5
Lost	1
Failures	4

While this procedure is unsatisfactory as a positive improvement of function, apparently because of its inadequate size, it has been of benefit from a negative aspect, as in several of these cases the muscle in its normal position represented a deforming factor hyperextending the great toe.

Transfer of Peroneus Longus to Ant. Tibial

This transfer was done in six cases, alone in two cases, combined with stabilizations in two cases, and in previously stabilized feet in two cases. The age at operation was about 10 years, varying as follows: 8, 9, 11 (two), 12 and 13. The paralysis had been present from 2 to 10 years, being 2, 3, 5, 8, 9 and 10 respectively.

In four cases the deformity was equino-valgus; in one an equino-varus, and one calcaneo-valgus. At the end of four years the transfer was strong in two and active in two. At three years the transfer was worthless in two. In the failures one never showed more than a trace of power, while the other showed slight activity at one year. The calcaneous foot required subsequent stabilization.

The deformity was corrected and function improved in all six cases. In only two, however, can this be attributed to the tendon transfer. Four cases walked with crutches before operation; one of these was enabled to get about well with one brace; while three cases are still using braces and crutches. One extreme limp was improved to a moderate limp, and one case with a slight limp before operation still has a slight limp.

Cases	6
Good results	2
Failures	4

Peroneus Brevis to Mid-Cuneiform

This transfer was done in two children, one of whom was also stabilized. One child was 9 years old, the other 13. The paralysis was of eight and nine years' duration. The deformity was equino-varus in both cases. The transfer was noted as strong in the case with stabilization, and active in the other, after two years. The deformity was corrected three years after operation in the stabilized case; while in the other there was slight varus and calcaneus. Both cases were improved functionally, the moderate limp being reduced to a slight limp in the case with stabilization; but in the other braces and crutches are still required.

Cases.	2
Good result	1
Failure	1

Even in the single case classed as a good result, it is questionable how much of the improvement is due to the transfer, and how much to the stabilization.

Peroneus Longus and Brevis into the Tendo-achillis

This transfer was done in ten cases. In five cases the transfer was preceded by stabilization, in four a stabilization was done concomitantly, while in one case the posterior tibial was also transferred. We are of the belief that this procedure is seldom useful except as an adjunct to stabilization. Two cases have been lost to follow-up. The ages at operation varied from 6 to 16 years, being 6, 7, 9, 10 (two), 11, 14 and 16. Paralysis had been present from 3 to 14 years—3, 6, 7, 8 (two), 9, 12 and 14 years respectively. The deformity was primarily calcaneous in all cases, being combined with valgus in four cases; cavus in one and both cavus and valgus in one.

In one case the function of the transfer has not been noted since one year postoperative, when it was active, and a second was active after two years. Of the five observed after three years, three were rated strong, one good and one active. Two have been noted after four years, one as strong and the other active.

Deformity was completely corrected in four cases and one patient showed slight valgus four years after operation. At two years in one case there was an increasing supination of the fore-

foot, which was corrected and held by arthrodesis of the metatarsal cuneiform, and scaphocuneiform joints. At three years one patient showed slight cavo-valgus, and one slight calcaneus. In all the foot was stable.

There was functional improvement in all cases. One child previously unable to walk was enabled to walk with braces; a moderate limp was improved to slight limp in one case, and restored to normal gait in two cases, while one slight limp was almost completely relieved. One still requires braces and crutches most of the time, but walks some without crutches; while in other cases a moderate and a slight limp persist.

Cases	10
Lost	2
Followed one year	1
Followed three years	2
Followed four years	5
Good results	4
Fair	1

Biceps to Patella

This transfer was done in one case, a 13 year old boy with paralysis of twelve years' duration. The ilio-tibial tract was divided at the same time, correcting 30° hip flexion and knock-knee, and the foot was subsequently stabilized to correct an equino-varus deformity. The transfer was protected in a caliper brace for three years. At the end of one year the transfer was active and able to set the patella strongly. At two years the patella would dislocate at 130° extension. At three years the knee required arthrodesis. Although function was improved by correction of deformity, the transfer must be considered a failure.

Case	1
Failure	1

Transfers in the Upper Extremity

In only one case was any tendon work attempted in the hand. Three concomitant procedures were carried out, namely transfering the abductor pollicis to flexor longus pollicis, the extensor carpi ulnaris to the flexor sublimis digitorum, and reefing the flexor carpi ulnaris. The results were good and contributing useful function at one and two year periods after the operation.

Results

Cases	1
Good results	1

Fasciotomies

Release of Plantar Fascia (Steindler's Technic)

This procedure was done in four cases of cavus, in three of which there was also an equinus. In one case there was a secondary manipulation; in another the toe extensors were transferred to the dorsum of the foot at the same time, and in a third case the same transfer and a lengthening of the tendo-achillis was done at a second operation. The acute disease occurred at two years or under in all of the cases. The age at operation was 9, 11, 12 and 14. There was a limp in all cases, classified as moderate in two, moderate but increasing in one, and extreme in one. The technic followed was that described by Steindler in 1917. The immediate correction was complete in all cases. At the end of one year there was no deformity and improved gait in two cases; one case showed equinus and was readmitted for transfer of toe extensors to dorsum and lengthening of Achilles' tendon; and one case showed equino-varus with dropping of the forefoot, in spite of strong action in the transferred muscles. This case was readmitted two years after operation with increasing equino-varus and cavus, and stabilized with plantar fasciotomy. At the end of three years all cases showed complete correction of the original deformity and the limp practically entirely corrected. At four years another case showed recurrence requiring bone operation. The procedure is considered of benefit when combined with suitable tendon work. In two of four cases subsequent bone operation was required and are therefore classed as a failure.

Cases	4
Good results	2
Failure	2

Division of Ilio-tibial Tract and Hip Fasciotomy

Hip flexion deformity was corrected in eighteen hips in 14 children. Correction was by division of the ilio-tibial tract in five cases; by hip fasciotomy in four; and in nine by these procedures combined. There is no particular difference in the age of the patients, nor the duration of the paralysis in the three groups, as shown in Table X.

TABLE X

	Age of Onset	Age at Adm.	Deformity
Division of Ilio-Tibial Tract	3 mos.	3 yrs.	30
	3 yrs.	6 yrs.	Not stated
	5 yrs.	9 yrs.	40
	7½ yrs.	13 yrs.	30
Hip Fasciotomy	3 mos.	3 yrs.	60
	1 yr.	4 yrs.	50
	2 yrs.	10 yrs.	45
	3 yrs.	12 yrs.	30
Combined	8 mos.	15 yrs.	60-60
	2 yrs.	10 yrs.	90-40
	3 yrs.	12 yrs.	40
	4 yrs.	9 yrs.	45
	5 yrs.	9 yrs.	40
	6 yrs.	9 yrs.	45-60

The technic employed in the first procedure is that described by Yount in 1923, consisting of exposing the ilio-tibial tract immediately above the knee and dividing it transversely, allowing the ends to retract and stripping up the intermuscular septum.

A modification of Soutter's hip fasciotomy

was employed. The anterior superior iliac spine is exposed through an oblique incision extending from immediately below the spine, two to three inches toward the trochanter. The muscles originating from the spine are detached and the contracted fascia over the tensor fascia femoris is divided and the wound closed. Following both procedures a long leg plaster is applied and patient placed in a Bradford frame with as much correction of the deformity as is comfortable. After two or three days the leg is gradually allowed to hyperextend, the lower canvas of the Bradford frame being removed for this purpose. If the pelvis tips forward, a plaster jacket is sometimes applied to control the pelvis. The more severe grades of deformity were treated by the combined procedures.

In all cases full correction has been maintained at the time of last examination, which was three postoperative in two cases and four years postoperative in the others. There has been definite improvement in function. All of these fourteen patients were severely crippled; six did not walk at all; three used braces and crutches; four, crutches (one of whom was a hand walker); and one walked without apparatus with an extreme limp. At the end of three years all of the children were walking: seven with the aid of braces and crutches, two of whom got about some without crutches; five more wore braces; two with marked limp, one was brace-free with a moderate limp, and one with a slight limp.

Cases	18
Good results	18

Tenotomy of Hamstrings

Other Tendon Work

This was done in one case for a 60 degree knee flexion deformity of nine years' duration, in a twelve year old boy. A forty degree hip flexion deformity and equino-varus were also present, the former being corrected concomitantly by dividing the ilio-tibial tract, while the foot was corrected by subsequent stabilization. A brace was substituted for crutches, and correction has been maintained to date of last examination, three years after operation. The boy gets about well with his brace in spite of extreme limp.

Cases	1
Good results	1

Tenotomy of the Tendo-achillis

This was done in one case, combined with manipulation, in a twelve year old girl with paralysis of nine years' duration. The foot was in extreme equinus following a pan-astragalar arthrodesis six years previous. The deformity has remained corrected for four years, except for some valgus and ten degrees equinus of the forefoot. The limp was reduced from that of an extreme equinus to that of an ankylosed ankle.

Cases	1
Good results	1

Tendon Lengthening of the Tendo-achillis

This procedure was carried out in eleven cases. In one case it was the only procedure. It was preceded by a stabilization in two, combined with a stabilization in one, and with a stabilization and transfer of the extensors to dorsum in one. In three cases it was combined with transfer of toe extensors to dorsum alone, in one of which a Steindler fasciotomy had previously been done, and in another this transfer and plantar fasciotomy. Another case was combined with a plantar fasciotomy and one with a talonavicular arthrotomy.

The type of operation used in these cases consisted of exposing the tendo-achillis through a medial incision, placed to avoid shoe irritation. The tendon is divided transversely for half its diameter on the posterior surface near its insertion, and similarly on its anterior surface at the upper angle of the wound. The foot is then forcibly dorsiflexed, causing the two segments of the tendon to slide on each other to the desired amount. This technic has the advantage of simplicity and the continuity of the tendon is preserved. The wound is closed and a plaster casing applied to the entire leg with the foot in correction and the knee extended. The plaster is bivalved and exercises started at one month.

The age at operation varied from 3 to 15, being 3, 6 (two), 8, 10, 11, 12, 14 (three) and 15. The duration of paralysis was from 2 to 13 years, being 2, 4 (three), five (three), 8, 10, 11 and 13.

The deformity was equinus, or a combination of equinus in all cases—three were a pure equinus; four equino-varus; two equino-valgus, and two equino-cavus.

Four cases have been followed three years and seven cases for four years. The equinus was completely corrected when last seen in all cases, but five of the eleven showed some element of deformity, there being some varus in the stabilized foot, two feet showed slight valgus, one cavus and varus, and one a moderate cavus correcting in weight-bearing. Gait was improved in all cases, one patient requiring crutches now has braces and crutches and extreme limp was made moderate; of five patients with marked limp, one has moderate limps, three slight, and one has none; in two patients moderate limp was made slight (one after a second operation), and in one a slight limp was completely corrected.

Cases	11
Good	6
Fair	5

OSTEOTOMY

Supra-Condylar Osteotomy of Femur

This was done in two cases for knock-knee deformity. In both cases the deformity was extreme. One patient showed slight recurrence in two years, which has not increased since. In the other correction has been maintained for three years.

Cases	2
Good	1
Fair	1

Osteotomy of the Tibia

This was done in 19 cases, in two of which it was bilateral, making a total of 21 osteotomies. The deformity present was torsion of the tibia in two cases, knock-knee in eight, and both of these conditions in eleven cases.

The age at operation varies from 3 to 15 years with more than half the patients between 9 and 12. The ages were 3, 4, 5, 5½, 8, 9 (three), 10, 11 (five), 12 (two), 14 and 15 (two).

Two patients were lost after one year, three after three years, and sixteen (76%), have been examined four years after operation. Both patients followed one year were satisfactory when last seen. Fifteen patients maintained complete correction and six showed recurrence of deformity. Two recurrences were at two years, the others all within the first year. This surprising recurrence was explained by the fact that the muscular imbalance producing the original deformity was not corrected, particularly contracture of the tensor fascia femoris.

Cases	21	
Lost at 1 year	2	
Good results	13	62%
Failures	6	28%
Uncertain	2	10%

Talonavicular Arthrotomy

This procedure was carried out in three cases and consisted of arthrotomy of the talonavicular articulation in an attempt to utilize the reflex peroneal spasm thus produced to reinforce the action of the peroneus longus and brevis. In one case the procedure was performed alone for a mild varus, in the second case the tendo-achillis was also lengthened to correct some equinus, and in the third case the peroneus longus was transferred to the insertion of the anterior tibial to correct a valgus deformity. All cases have been observed for three years and the results were satisfactory in the second case only, in which there was a progressive improvement of gait with slight valgus. In all cases a temporary spasm was obtained, but it did not persist. In the first case the varus recurred in one year and the foot was then stabilized. The deformity again recurred and three years after the first operation the patient was again admitted and the deformity corrected by a wedge resection, with transfer of the anterior tibial to outer side of foot. In the valgus case there was recurrence in one year and the patient was readmitted for stabilization and transfer of toe extensors to dorsum, which has given a good result to date.

Cases	3
Good results	1
Failures	2

SUMMARY

These cases are presented because of our conviction of the extreme importance of careful follow-up study in determining the value of surgical procedures, particularly of this type. Results, which may appear excellent at first, may subsequently be unsatisfactory. The value of such a check-up on these cases is twofold. It is essential to the welfare of the individual child, and also to the surgeon in the treatment of future cases.

We do not consider this an *end* result study except in the upper age group (14 years and over). The younger cases will continue to be followed for another five or more years.

There are several points observed in the analysis which we would like to recapitulate:

(1) The disease is primarily one of infancy and early childhood.

(2) Any muscle or groups of muscles may be affected, but the legs are more than twice as commonly involved as the arms.

(3) In a surprisingly small number of cases, in this series, had there been any efficient treatment during the early stages of the disease.

(4) A definite relationship was seen between scoliosis and unequal paralysis of the abdominal muscles.

(5) Practically all possible types and combinations of deformity were seen; the deformities of the foot being most common.

(6) Eighteen per cent. of the children were unable to walk on admission, in all of whom gait was established.

(7) Of twenty-nine patients without operations, two were markedly improved, and eight slightly benefited.

(8) One hundred and ninety-eight surgical procedures were carried out on eighty-seven patients. One hundred and fifty-two of these were observed three or more years after operation. Of these one hundred showed "good" and twenty-five "fair" results.

MEDICAL PROGRESS

PROGRESS IN THE STUDY OF CARDIOVASCULAR DISEASE IN 1929

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I. Introduction

THE year 1929 has carried forward certain investigations of considerable importance in the field of cardiovascular disease. The changing viewpoint concerning the rheumatic disease has sought to re-define such fundamental subjects as the character and specificity of the Aschoff body. The part played by the streptococcus in this disease has been challenged by some and defended by others. Bacteriologists and pathologists are still in need of the aid of the clinician in the problem, but the explanation offered by the concept of allergy has grown in popularity.

The control of hypertension seems but little nearer to solution, but again the physiological attack is encouraging.

Coronary disease has attracted increasing attention and new therapy by surgery and x-ray is offered for angina pectoris.

Electrocardiography, far from having exhausted itself, as has been suggested, has added more important data, as in the work of Wilson and his associates in the reversed interpretation of right and left sided cardiac activity.

The authors of this review have tried to make a representative selection of articles showing the major advances of the past year, realizing that relative conciseness must compensate for some incompleteness.

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II. Anatomy and Physiology

Grant and *Viko* have studied the Thebesian vessels in a series of mammalian hearts, including fourteen human, by injection with gelatine and celloidin masses. They found three main types which merge into each other. "(a) Vessels subdividing into trees ending in a capillary network and ramifying in the endocardium and underlying muscle. (b) Channels uniting neighboring foramina and showing fine anastomoses between neighboring trees. (c) Vessels uniting foramina with coronary veins, either by fine anastomoses or by direct communications. The coronary arteries communicate with the Thebesian vessels only through capillaries."

Stimulated by the indefinite and conflicting descriptions in the standard textbooks on anatomy concerning the lymphatic drainage of the human heart, *Shore* by injecting Prussian blue has been able to study the main trunks, and finds that: "1. The lymph drainage of most of the right ventricle is directed by an anterior lymph trunk to an extra-pericardial group of glands lying in the superior mediastinum anterior to the great vessels. 2. The drainage of the left ventricle is directed by a posterior lymph trunk to an extra-pericardial gland of the right superior tracheobronchial group posterior to the superior vena cava."

Bromer, Tschiesche, and *Wearn* have succeeded in finding blood vessels in the valves of seventy-four out of one hundred human hearts by using a new method of injection. The presence of vessels in the valves seemed to bear no relation to age. Vessels were demonstrated in the mitral valve in 58 per cent. of the hearts, the tricuspid valve in 43 per cent., the pulmonary valve in 25 per cent., and the aortic valve in 5 per cent.

Robertson has made a study of the blood vessels of the thoracic aorta, and has found them to be most numerous in the aortic wall where aortic disease, other than senile change, is most commonly localized. A relation seemed to exist between the presence of certain lesions of the aortic wall and of the vasa vasorum; luetic aortitis and aneurysm are found most frequently in the ascending limb of the aortic arch, and it is here that vascularization is most abundant. Nodular endarteritis appears in the descending aorta and is most advanced about the intercostal

openings, and in these areas vasa vasorum are very abundant.

In a series of publications *Grollman* has reported the results of his studies on the cardiac output of man by the use of acetylene. Because of the increase and constancy of solubility of this gas over any of those previously employed, and the ease with which analyses can be carried out, he finds the method superior to any heretofore recommended. His figures for 51 persons in the resting basal condition indicate, that like the basal metabolic rate, the cardiac output of normal men and women is a function of their surface area and can be predicted with a high degree of accuracy. The output per minute for an average sized individual is 3.8 liters, but with exercise it may be as much as 30 liters. The output after the ingestion of 1,000-1,500 c.c. of water may rise as high as 26 per cent. above the basal value, although usually not more than 10 per cent. In view of the widespread practice of forcing fluids, these facts should be considered when there is evidence of cardiac weakness. The ingestion of saline may increase the output by 50 per cent. The cardiac output was found to be greatly elevated soon after the injection of typhoid vaccine but did not follow the malaise and pyrexia throughout the course of the reaction.

Burwell and *Smith* have studied two groups of cases, one presenting systolic blood pressures of more than 175 mm. and one of systolic blood pressures less than 95 mm. of mercury. They found the total cardiac output per minute, the cardiac output per minute per kilogram of body weight and the cardiac output per hundred cubic centimeters of oxygen absorbed did not show significant differences.

Hitzenberger and *Tuchfeld* have studied the volume of the circulating blood at different intervals following the injection of epinephrine into healthy persons and into patients. It was found that an increase in the volume of blood occurs in about 50 per cent of normal persons; in patients with polycythemia or with myelocytic leukemia a considerable increase occurred; while in patients with atrophic cirrhosis of the liver epinephrine injections caused no increase in the volume of the circulating blood.

Gladstone has discussed the hemodynamics of the normal circulation and of the circulation in aortic insufficiency and reviewed the literature. He shows that the brachial blood pressure depends upon the intra-aortic pressure head, while the femoral blood pressure depends upon the sum of the intra-aortic pressure head and the velocity head, hence the so-called differential blood pressure. He believes that in aortic insufficiency regurgitation plays a considerable rôle, and he analyses the dynamics which tend to reduce the amount of blood regurgitated. The collapsing pulse and capillary pulsation is believed to depend upon the rapid egress of blood from the arterial system resulting from the abnormally high systolic velocity head, and the exaggerated spurt-like character of the arterial flow.

The same author has investigated the mechanism of production of the sounds heard when one decompresses the cuff in determining blood pressure by the auscultatory method (Korotkoff sounds). This is an unsettled question and numerous theories have been advanced to explain it. The factors concerned have been analyzed and a new explanation has been suggested, namely, the sounds are produced by sudden distention of an artery whose walls were previously relaxed because of the surrounding pneumatic cuff whose pressure opposes the diastolic intra-arterial pressure and keeps the artery undistended during diastole. Concerning the mechanism of production of the auscultatory gap, the author believes that normally during the second phase the arterial sound is first dulled and then absent, but the dulling and absence are normally obscured by the murmur which appears during the second phase. The auscultatory gap occurs approximately where one would expect the second phase. The gap is considered abnormal, not so much because of the absence of the sound but because of the absence of the murmur. It is believed that the murmur disappears because of the diminished rate of blood flow in such cases as hypertension and aortic stenosis where the phenomenon has been frequently noted.

Crawford has found that peripheral stimulation of the cervical sympathetic causes a contraction of the capillaries in the rabbit's ear at a definite interval after arteriolar contraction or even when the arterioles remain dilated after acetylcholine. However, the production of congestion by venous obstruction causes either failure of this capillary contraction or a considerable prolongation of the latent period.

Stewart has studied the effect of exercise on the size of normal hearts and on enlarged hearts of dogs. His experiments show that dilatation of the heart does not occur in normal dogs following voluntary exercise. On the contrary, the size of the heart decreases. When dogs in which the heart is enlarged in consequence of artificially created valvular defects, but in which there is presumably no myocardial disease and in which there are no signs of heart failure, are subjected to exercise, the size of the heart likewise decreases.

Grant and *Jones* have investigated the effect of histamine and local injury on the blood vessels of the frog, and have pointed out that following local injury there is a local and active dilatation of the minute vessels independent of the nervous system, and a surrounding secondary dilatation of the minute vessels dependent on the integrity of a local nervous mechanism which corresponds to the "flare" of the human reactions. The local reaction and "flare" have been shown to be due to the action on

the vessels and nerves of some chemical substance released from the damaged tissues. They also showed that histamine, the substance very probably responsible for the reaction in man, causes no dilatation of the frog's blood vessels either when applied locally or when given intravenously. Aqueous solutions prepared from alcoholic extracts of frog's skin reproduce the injury reaction when applied to the frog's tongue, and the same effect was produced by similar extracts of ox lung and human skin. The active substance in this solution is presumably a base of the histidine-argimine fraction and it is thought probable that this base is the substance released from damaged tissue in the frog and that it is responsible for the vascular reaction to injury.

III. Etiology and Pathology

A. Congenital

Redisch and *Rösler* have studied the condition of the capillaries in 36 patients with congenital cardiac lesions and they believe that the cyanosis in these cases is due, not only to the polycythemia and abnormally large amount of reduced hemoglobin, but also to the peculiar capillary structure, consisting of numerous arched and winding loops with wide venous limbs. The sluggishness of the capillary stream is a marked feature.

Smith has added a new instance of congenital cardiac defects in twins to two other instances in the literature. In the cases described patency of the ductus arteriosus existed as a solitary cardiac defect in both of the twins. The clinical course and pathological observations in the author's cases are described, and reference is made to the manifestations observed in other cases of patent ductus arteriosus occurring in infancy.

Baumgarten and *Abbott* have reported a rare congenital cardiac anomaly with postmortem findings similar to those described by Eisenmenger in 1897 ("Eisenmenger complex"). The patient was a man 20 years old with a large interventricular septal defect, dextro-position of the aorta, and dilatation of the pulmonary orifice and artery (as compared with pulmonary stenosis found in the "Tetralogy of Fallot"). There was slight cyanosis and a history of hoarseness and aphonia since the age of 13 years (due to pressure on the left recurrent laryngeal nerve by the dilated pulmonary artery). The prominence of the pulmonary conus was well shown by x-ray. Death resulted from cerebral abscess resulting from paradoxical embolism.

Steinwinder and *McPeak* have cited the case of an adult laborer with a congenital absence of the interventricular septum, who despite his cardiac anomaly was capable of performing manual labor until the last year or two of his life. Even with such an unusual defect the heart held up for twenty-three years, and not until the patient was stricken with a widespread respiratory infection did his reserve give way completely. The heart was tremendously enlarged, with hypertrophy of the right ventricle apparently predominating. The large vessels at the base were normal except for a transposition of the aorta and pulmonary artery. The foramen ovale had failed to close completely, and there was a complete absence of the interventricular septum. That portion of the common chamber corresponding to the right ventricle was many times larger than that corresponding to the left. There was an appreciable narrowing of the mitral and pulmonary orifices, while the aortic valve was intact and showed no evidence of disease.

Harrison reported the case of a girl aged 16 years who showed at autopsy the "Tetralogy of Fallot" (Congenital pulmonic or infundibular stenosis, interventricular septal defect, dextroposition of the aorta, and right ventricular hypertrophy). The pulmonary orifice was markedly stenosed measuring only 3 mm. across. There was a complicating massive right sided endocarditis involving the tricuspid valve, the right ventricular wall and the aortic valve, apparently due to the streptococcus viridans.

White and *Sprague* reported "the case of a notable musician, Henry F. Gilbert, who for nearly sixty years of his life suffered from congenital heart disease with cyanosis and clubbing of his fingers. The case is of great interest, first, because with the tetralogy of Fallot he survived to his sixtieth year, surpassing in age all patients previously reported by more than twenty-three years, and secondly, and most significantly, because he made of his crippled life a great success, establishing himself in his musical profession as one of the greatest of American composers and as a pioneer of native American music. We have recounted the history, accomplishments, physical examination, laboratory data and the condition found post-mortem in this remarkable man. The diagnosis of the cardiac defects was correctly made a year before his death. Fallot had demonstrated that this was possible forty years ago. We trust that the account of this man's life may bring hope and inspiration to other victims of heart disease."

B. Rheumatic Infection and Rheumatic Heart Disease

Draper and his co-workers, continuing their studies on the human constitution, have investigated the families of 44 unrelated patients suffering from acute rheumatic fever, and the total population included 1,343 persons of whom complete disease histories were obtained, and of this total population 15.2 per cent. gave a history of rheumatism; whereas, in a control group of 910 individuals, only 5 per cent. gave a rheumatic history, which is assumed to represent the incidence of rheumatism in the general population. It is suggested from these studies that possibly

a parent may carry the susceptibility for rheumatism, though he or she may not develop it. Furthermore, "it would seem that the specific resistance against acute rheumatic fever tends to break down in members of a given fraternity at a definite age for that fraternity. It is difficult to interpret this phenomenon in any other way than as the expression of an inherited special 'age-resistance' character."

In discussing the rôle of streptococci in rheumatic disease, *Small* has offered an hypothesis embracing a dual nature of its pathogenesis, as follows: "The specific toxin of a streptococcus is suggested as operative in the production of the "destructive" and "proliferative" types of lesions in rheumatic fever, while the patient's hypersensitization to an allergen associated with the protein of streptococci is presented as concerned in producing the "exudative" lesions. The specificity of this sensitizing substance, or allergen, is not dependent upon the type of streptococcus supplying it. Chronic arthritis is presented as an allergic disease, the hypersensitive state of the patient being due to this allergen contained in streptococci without regard to the particular type. The specific treatment of rheumatic fever embraces both the neutralization of the toxemia, and adequate desensitization. The treatment of chronic arthritis is concerned largely with elimination of foci harboring streptococci, and with adequate desensitization. Stock extracts of streptococci may be employed in this desensitization, and because of their dosage requirements may be better determined through extensive clinical application. They are preferable to autogenous preparations."

In a fairly comprehensive manner *Swift*, in the Hektoen Lecture for 1929, has presented the present status of our knowledge concerning rheumatic fever, covering the clinical, pathological, and etiological aspects of the disease, together with a brief review of the outstanding investigations that have led to the present views. He discusses three hypotheses as to the etiologic rôle of streptococci; namely, (1) elective localization; (2) specific streptococcus elaborating a specific toxin; (3) rheumatic fever as an allergic phenomenon. He feels that the last hypothesis offers the most reasonable explanation, and in the light of this hypothesis he believes the future investigation must be aimed at the desensitization or immunization with suitable antigenic substances in order that some method of building up the immunity may be established so that the liability to renewed infection will be lessened, or that if new infection occurs the reactivity of the tissue will approximate that of immunity without hypersensitiveness. This is one of the problems that he and his co-workers are attempting to solve at the present time.

Birkhaug continuing his previous studies has reported his results on a series of 3,114 skin tests performed on 594 persons, among whom were 42 with active and 146 with inactive or "cured" rheumatic fever, carditis and chorea; 69 with chronic infectious and degenerative arthritis, and 337 non-rheumatic controls. An excessive universal hypersensitiveness was found among 68 per cent. of patients with all types of acute rheumatic infection to filtrates, autolysates, and bacterial suspensions produced by the indifferent streptococci and the streptococcus viridans; while only 22 per cent. reacted to the filtrates and 36 per cent. to the autolysates and bacterial suspensions produced by the nonhemolytic streptococci. Among a series of 69 cases of chronic arthritis, 53 cases showing definite foci of infection, 47 per cent. reacted markedly to the products of both nonhemolytic and hemolytic streptococci. The author concludes that a nonspecific, common allergenic factor is present excessively in the bacterial products of indifferent and viridans streptococci and moderately present in solutions of hemolytic streptococci, to which patients with either acute rheumatic infections or chronic arthritis show hypersensitiveness.

McCulloch and *Irvine-Jones* have endeavored to determine how far the routine supervision of rheumatic children in hospitals and clinics affects the tendency to recurrence of rheumatic manifestations. The clinical and experimental evidence tends to show the close association of infections of the upper respiratory tract with the rheumatic syndrome. Tonsillectomy, when followed by hygienic measures, general and local, is of value in decreasing the number of recurrences of rheumatic fever and chorea. Care in a convalescent home is of immediate benefit to the child, but does not seem to lessen recurrences after the child goes home. In a group of 90 children with constant infection in the nasopharynx, the percentage of recurrences of rheumatic fever and chorea was paralleled by the degree of success obtained in combatting the infection and improving the living conditions of the child.

Kaiser has studied the relation of the tonsils to acute rheumatism during childhood in a series of 439 rheumatic children and has made the following observations: "In nearly twice as many children in the community studied the first attack of rheumatism developed when the tonsils were still present. Recurrent attacks of rheumatism occurred 10 per cent. less often in children who had their tonsils removed after the first attack of rheumatism than in those whose tonsils were not removed. The incidence of carditis as a complication in acute rheumatism was nearly as frequent in children who had undergone a tonsillectomy as in those who had not. Tonsils are the avenue of infection in many cases of rheumatism and bear a definite relationship to this disease. Their removal should be advocated in the rheumatic and potentially rheumatic child until more is known of the etiology of rheumatism."

Cecil, Nicholls and *Stainsby* have reported a

study of the bacteriology of the blood and joints in rheumatic fever. In 1928, 31 per cent. of 29 patients with acute rheumatic fever gave a blood culture positive for streptococci; in the spring of 1929, by using a new technique, 84 per cent. of 31 similar cases gave a positive streptococcus blood culture. Thirty-five strains of streptococci were recovered and 33 of these were viridans in nature. Of 7 patients with acute rheumatic fever, 5 showed positive streptococcus cultures from joint fluid, and of these five, three had also positive blood cultures of the identical organisms. The authors are of the opinion that although allergy plays a part, the joint manifestations are primarily due to the presence of the bacteria themselves in the joints.

In spite of the accumulating evidence in favor of the rôle of the streptococci as the etiologic factor in rheumatic fever, certain other studies of a somewhat contradictory nature have been reported. *Poston* has cultured 120 glands from cases of infectious arthritis and a growth was obtained in 60 per cent., and 93 per cent. of the organisms grown belonged to the streptococcus viridans group.

In a discussion of the significance of postmortem bacteriologic examinations, *Epstein* and *Kugel* report that they were able to culture at least one organism at necropsy in 66 blood cultures and 62 bone marrow cultures. Of forty-three valve cultures, four were sterile. Nonhemolytic streptococci were found in blood, bone marrow, heart muscle or valve in 86 per cent. of the cases. The authors conclude that "no significance can be attached to the recovery at necropsy of such organisms as streptococcus alpha, streptococcus gamma, enterococcus, staphylococcus aureus, B. coli, and B. pyocyaneus unless the same organism has been found during life.

Clawson has published a review of the so-called "rheumatic or Aschoff nodule". He doubts whether it should definitely be considered a specific lesion resulting from a specific rheumatic virus, and makes the following observation: "The type of inflammation found in the rheumatic nodule in man canont be said to be characteristic. In a relatively high percentage of cases of acute rheumatic endocarditis, the Aschoff nodules are not found in the myocardium. They are not infrequently found in the heart in cases of nonrheumatic infectious diseases. Nodular areas with a cellular content similar morphologically and similar in staining characteristics have frequently been produced experimentally in rabbits by the injection of streptococci."

Fahr suggests replacing the terms "infectious rheumatism" and "rheumatic polyarthritis" now in common use by the more completely descriptive term "rheumatic granulomatosis," since systematic examinations have proved that the rheumatic nodules are found in many organs. Aschoff first discovered them in the myocardium, but they have subsequently been found in many organs; the entire loose connective tissue seems to be predisposed to the formation of these granulomas.

Parsons and *Edgar* assert that the acid-base equilibrium of children suffering from acute rheumatism, whether in the acute, convalescent or quiescent stages of the disease, is normal. There is no evidence in favor of the view that the symptoms of rheumatism are due to an excess of acid in the tissues, or that the rheumatic child is an "acid" child.

In an interesting study of pericarditis in fifty children with rheumatic heart disease *Holt* has arrived at the following conclusions. "Rheumatic pericarditis appears in association with a severe infection and one which appears early in life. The prognosis is bad; more than one-third of those children who recover from the acute attack are likely to die within three years; probably one-half will die within five years; few will ever lead normal lives. Pericarditis is associated with valvular disease, usually mitral stenosis, often with aortic insufficiency, and is usually merely one part of progressive heart disease. Marked cardiac enlargement is the rule; auricular fibrillation may be present. Ascites appears as part of a general breakdown, and when present presents a somewhat different picture from that described as Pick's disease. Some physical signs are likely to be present except in those cases in which there is little enlargement of the heart and the general health is unimpaired. These signs may appear within a few months following an acute attack of pericarditis; but their absence does not necessarily exclude the presence of chronic adhesive pericarditis."

Cookson has studied the occurrence of auricular fibrillation in children under 17 years of age admitted to the London Hospital in the fifteen years 1913-1928. There were 30 cases in the total 1,164 cases diagnosed as auricular fibrillation and five have been added from other sources making a total of 35 cases analysed. Of these 35, rheumatic heart disease was the basis of the arrhythmia in all cases and a history of the acute illness was lacking in only six. Failure was a frequent accompaniment of the inception of the new rhythm and occurred in twenty-two out of thirty in which satisfactory information on this point could be obtained. Clinically, mitral stenosis was diagnosed in twenty-five, four of these had aortic incompetence in addition, in two the aortic valve alone was affected. The heart was enlarged in all, and was considerably enlarged in seventeen. Thirty-one of the series have been traced, and of these twenty-three have died of heart disease after an average duration of ten months with auricular fibrillation, the maximum period being five years and the minimum three weeks.

C. SUBACUTE BACTERIAL ENDOCARDITIS

Kürten has reported his observations on the blood serum in 35 cases of endocarditis lenta. In 33 cases he observed that the serum from such patients jellied when 2 drops of formaldehyde solution were added to 1 c.c. of serum, while normal serum and serum from patients with other disease did not give this reaction. He determined the albumin and globulin content of the serum and detected a relative and absolute increase in the globulin, and he believes that it is this increased globulin content that causes the serum to jelly. Another reaction that he considers characteristic is the ability of serum from patients with endocarditis lenta to absorb the dye naphthol yellow to a lesser degree than normal serum. This phenomenon is also due to the increase in globulin since it does not combine with the dye.

Kurtz and *White* have reported the treatment of a case (26 year old woman) of slowly progressive subacute bacterial (streptococcus viridans) endocarditis by immunized blood transfusions from donors vaccinated with a killed culture obtained from the patient's blood. One massive transfusion of 1800 c.c. and five smaller ones (500 c.c. each) were given over an interval of three months with no appreciable effect on the course of the disease, which terminated fatally seventeen months after the onset. Serological studies showed the antibody titer to be higher in the patient than in any of the donors.

Lian, Nicolau and *Poincloux* have studied the histopathology of an Osler node from a case of subacute bacterial endocarditis. The node and surrounding tissue were obtained from the end of a finger by biopsy and a blood culture taken a few minutes later showed a growth of streptococcus viridans. The lesion itself consisted of an area of proliferative and degenerated tissue comprising arterioles and capillaries with endothelial cell increase encroaching on and finally obstructing the lumen, along with polynuclear perivascular infiltration including some giant cells.

D. ANGINA PECTORIS

Levine, Ernstene, and *Jacobson* produced typical attacks of angina pectoris in ten of eleven patients subject to this trouble by injecting 1 c.c. of 1:1000 solution of adrenalin subcutaneously. Ten normal controls treated similarly had no pain. The authors suggest the possible use of this procedure as a diagnostic test for angina pectoris. [It should be used, if at all, only in very rare cases.]

Katz has reported the case of a woman, age 55 years, with diabetes mellitus who had a typical attack of angina pectoris after each injection of insulin. The attacks did not recur after the insulin was discontinued, and although the glycosuria was not completely cured, the patient felt well.

Vaquez, Giroux, and *Kisthinios* have secured relief of angina pectoris in 14 of 20 patients by the daily injection for 15 to 20 days of 40 units of an insulin-free extract of the pancreas.

E. CORONARY DISEASE AND THROMBOSIS

Levine, in a monograph of 174 pages, has reported the results of an analysis of 145 cases of coronary thrombosis with pathological data on 46 of these, and has reviewed the clinical features of the disease.

Barnes and *Whitten* studied the Q-T interval of the electrocardiogram in 47 cases of myocardial infarction together with the postmortem findings at the Mayo Clinic. The authors have called attention to the fact that when infarction occurs in the anterior portion of the left ventricle and apex, in the region suplied by the left coronary artery, the earliest electrocardiographic evidence of this fact is a change of level and contour of the S-T or R-T interval in leads I and II, and depression of the S-T interval in lead III. The R-T interval in leads I and II, but especially in lead I, shows an elevation above the iso-electric line. With infarction in the posterior portion of the left ventricle, alone or combined with apical infarction, precisely the opposite set of conditions is produced; namely, an elevation of the R-T interval in lead II and III, and a depression in lead I. In a later stage the inversion of the T waves in leads II and III, with a rounded contour of the preceding S-T segment is observed, whereas the T waves in lead I are upright and become exaggerated or more sharply peaked. The authors feel that these changes are so typical that it is possible to predict with great accuracy the site of infarction in the left ventricle and which coronary artery is involved, providing the region is supplied by the usual coronary circulation.

Pearcy, Priest, and *Van Allen* have been able to produce acute severe pain in 40 out of 50 dogs by sudden occlusion of either coronary artery or of either or both branches of the left coronary artery, the pain beginning almost instantly after occlusion, lasting through occlusion, and ceasing immediately with release of the occlusion. A few cases showed ventricular fibrillation when both coronaries were suddenly occluded. The ten dogs giving less clear-cut results had not sufficiently recovered from the operation to respond properly.

The technical details of these experiments are somewhat unique and are of considerable interest. The operation was performed under ether anesthesia by intratracheal insufflation and without other medication. The chest was opened by a transverse incision and a good exposure obtained by the use of a rib-spreader. The coronary arteries were exposed by dissection at the base of the heart, and a thread of vaselined heavy linen was passed under each coronary artery within a centimeter of its exit from the aorta. The threads were attached to special de-

vices for occluding the vessels and the chest was closed securely, after taking care to avoid partial pneumothorax. Two types of devices for vessel occlusion were used. In some experiments a specially prepared camera shutter release to which the threads had been attached was employed, and protruded from the chest at the wound and was arranged in such a manner that by pressing the release, a short bar pressed firmly upon the artery. A second method was that of attaching the traction threads to a suitable wire which was introduced into the thoracic cavity from a stab incision in the base of the neck. Traction upon the wire exerted traction upon and occlusion of the coronary vessels with minimal disturbance of the heart. By either method the arteries could be occluded or released at will, and 3-4 hours after operation the pain responses were studied.

Bates and *Talley* reported an interesting case in a male negro 28 years old showing typical electrocardiograms of "coronary occlusion" following a stab wound in the base of the left ventricle in the region of the main branches of the left coronary artery. The wound was repaired surgically and complete recovery followed with return of the electrocardiogram to normal eighteen weeks after the injury.

Allen and *Willius* have been unable to find any definite relationship between thrombo-angiitis obliterans of the extremities and disease of the coronary arteries and they feel that the incidence of disease of the coronary arteries in thrombo-angiitis obliterans is probably not materially greater than the association with other diseases in the same age period.

Hughes, et al have reported the case of an infant, aged 7 weeks, who died suddenly following a short period of cyanosis and distressed breathing. Postmortem examination showed a heart normal in size, but with marked thickening and tortuosity of the coronary arteries which stood out as cords from the rest of the heart. The valves were normal. Microscopically the coronary arteries showed more or less obliteration by extreme intimal thickening. The media was almost completely calcified, and throughout the myocardium were areas of early fibrosis.

F. BLOOD PRESSURE: HYPERTENSION AND HYPOTENSION

Donnison has made a study of 1,000 native Africans in Kenya Colony and not a single instance of elevated blood pressure was encountered, but abnormally low blood pressure was not uncommonly noted. On no occasion was a diagnosis of arteriosclerosis or chronic interstitial nephritis made. The results of his investigation lend support to the view that hyperpiesia and arteriosclerosis are diseases associated with civilization.

From a study of the age and sex incidence in a series of 1,771 cases of uncomplicated arterial hypertension in the wards and out-patient department of the Boston City Hospital seen over a period of 44 months, and using 30,184 control cases for comparison, *Riseman* and *Weiss* have observed that "the curve of age incidence of out-patient and ward patients with hypertension in the Boston City Hospital shows a gradual and progressive rise up to the age period of forty to forty-five years. After the age period of forty to forty-five years there is a sudden rise in the curve. After the age of seventy, the incidence drops sharply. Over 60 per cent. of the cases occurred in patients between the ages of forty-five and sixty-nine inclusive. The onset of the steep rise in the age incidence curve of hypertension occurs almost five years earlier for women (forty-five to forty-nine years) than for men (fifty to fifty-four years). Hypertension was present more frequently among female than among male patients of the Boston City Hospital. It occurred in 2.9 per cent. of the total number of male, and 6.6 per cent. of the total number of female patients admitted to the medical out-patient department during the period under consideration."

Weiss and *Ellis* have shown "that, in essential arterial hypertension, although an abnormally high pressure exists in the arteries and arterioles, the capillary and venous pressures are normal. In other words, there is an abnormally great drop in the pressure gradient between the arterioles and capillaries. Notwithstanding the high pressure in the arteries the average cardiac output per minute, the stroke volume of the heart, the velocity of blood flow, and the circulating blood volume are slightly less than in healthy individuals. This study indicates that in order to gain beneficial results by means of a reduction of high blood pressure, the arteriolar resistance must be diminished. Therapeutic measures which induce a lowering of the blood pressure by lessening cardiac output or decreasing blood volume cannot be of permanent benefit."

Kernohan, Anderson and *Keith* have studied the arterioles in 53 cases of essential hypertension by means of biopsy and histological examination of a small portion of the pectoralis major muscle. The patients' ages varied from 8 to 65 years. "There were definite changes in the arterioles in many cases . . . The most pronounced and most constant change observed in the vessels was in the media, which was definitely hypertrophied, and there was an increase in the nuclear elements of this tissue; the entire change was due to proliferation of muscle. There was no fibrosis or increase in connective tissue. There was sometimes endothelial thickening too. No degenerative or senile changes were found." The authors incline to the view that the arteriolar changes antedate rather than follow the hypertension, but the primary cause of diffuse hypertensive vascular disease is still obscure.

Amberg made an analysis of a group of 25

children with increased blood pressure ranging from the age of 6 to 16 years who were examined and treated at the Mayo Clinic during a period of eight years. The cases are divided into the following groups: (1) hypertension associated with coarctation of the aorta, in which patients the elevation in blood pressure is confined to the upper part of the body; (2) hypertension as the consequence of an organic cerebral lesion; (3) hypertension in the form of so-called essential hypertension; (4) hypertension in the form of a syndrome of malignant hypertension; (5) hypertension associated with cardiac decompensation; (6) hypertension intimately associated with disease of the kidney. This whole group is not composed of homogeneous material, and no further attempt at a subdivision is made.

Vaquez, Donzelot and *Géraudel* report an interesting case of a man of 37 years who for 6 - 8 months had had frequent attacks of paroxysmal hypertension. X-ray treatments of the lumbar region gave temporary relief for several months. Autopsy revealed a tumor of the right adrenal. *Shipley* reports a similar case in which the symptoms were relieved by surgical removal of the tumor.

Rappaport has investigated the possible relation between blood pressure and respiration, and concludes that "depot function of the lesser circulation is the principal factor in the regulations of pressure conditions prevailing in the systemic circulation. Reduction of this depot function as caused by reduced respiratory function is probably the most important factor in the pathogenesis of chronic hypertensive disease. Hyperventilation exercises carried out in the form of an intensive and prolonged training of deep breathing are capable of bringing about marked reductions of pathologically increased blood pressures."

The effect of sodium chloride on the blood pressure has been studied by *Berger* and *Fineberg* on eleven patients with so-called essential hypertension, on one patient with nephrosis, and on another with hypertension associated with acute glomerular nephritis. In only one of these cases was there an appreciable drop in blood pressure which seemed to be due to a low salt diet. It seemed that reduction of the sodium chloride intake in most of the cases did not cause a drop in the blood pressure level. Raising of the sodium chloride intake above the normal level did not have any appreciable effect on the blood pressure. In the patient with nephrosis the edema, but not the blood pressure, varied with the amount of sodium chloride in the diet. The initial level of the plasma chlorides bore no relation to the subsequent course of the case.

Lieb has made an interesting study on the effect on human beings of a twelve month's exclusive meat diet based on intensive clinical and laboratory studies on two arctic explorers, Stefansson and Anderson, living under average conditions in a New York climate. In neither subject was there a decrease in physical vigor, and the same held true of their mental vigor. Both appeared ruddier at the end of the experiment than at the beginning, and one of them affirmed that he endured the summer heat better than during former years. The blood pressure in one subject was maintained at 105 mm. of mercury systolic and 70 mm. diastolic during the entire course of the experiment. The blood pressure of the second subject was 140 mm. of mercury systolic and 80 mm. diastolic at the beginning of the diet and 120 mm. systolic and 80 mm. diastolic on the completion of the year's diet. There was no variation from the normal in the pulse, temperature, and sleep.

Kisch has studied the occurrence of hypotension and found it present in 1,967 persons out of a total of 28,600 examined, or 6.88 per cent. The author classified the patients into three groups: (1) patients with cardiac and circulatory disturbances; (2) those with pulmonary tuberculosis, malignant tumors, gastric and duodenal ulcers, pernicious anemia, herpes zoster and urticaria; (3) those with constitutional hypotension.

Strasser and *Löwenstein* concluded from a study of hypotension in 108 persons with systolic blood pressures ranging between 110 and 100 mm. of mercury and 272 persons with systolic blood pressures of 100 mm. or less that, although hypertension is a disease and frequently leads to pathologic changes, hypotension is not a disease and does not lead to pathologic changes; in the great majority of cases hypotension is merely a constitution variation.

G. MISCELLANEOUS

AURICULAR FIBRILLATION. From the standpoint of etiology and pathology, *Yater* has studied a series of 145 cases of auricular fibrillation, seven cases of auricular flutter and two cases of paroxysmal tachycardia, all with autopsies. The usual types of heart disease were found; cases of endocarditis and hyperthyroid states were the most numerous. Hypertension was found to be a common condition, but the occurrence of auricular fibrillation in other types of heart disease was uncommon. In about 8 per cent. of the cases of auricular fibrillation there was a combination of possible etiologic factors and in about 9 per cent. an etiologic factor could not be suggested. Twenty-nine hearts which had been the seat of these arrhythmias were studied microscopically. A distinctive lesion for the arrhythmia was not found, and the lesions were not considered in themselves of sufficient importance to account for the arrhythmia. Therefore, there apparently is not a specific histologic syndrome in auricular fibrillation and probably none in auricular flutter and paroxysmal tachycardia.

OBESITY. Scharpff has made a roentgen-ray study of the size of the heart in 51 obese persons before and after reduction in weight: With the

exception of the patients who had a definitely small heart before the reducing cure was begun, a diminution in the size of the heart in patients with a normal cardiovascular system was demonstrated following a loss of weight of 7 Kg. (15 2/5 pounds). In patients with a normal myocardium and high blood pressure, a marked diminution in the size of the heart was noted following loss of weight; in these patients the reduction of the blood pressure was of greater influence than the reduction of body weight. In patients with pathological changes in the myocardium and a normal blood pressure, a loss of body weight was not followed by a decrease in the size of the heart; those who had a diseased myocardium plus hypertension showed a decrease in size of the heart with loss of weight.

TYPHOID FEVER. Brow has found a delayed P-R interval in the electrocardiogram (partial heart block) in 14 (21.5 per cent.) of 65 patients with typhoid fever. The ages ranged from 7 to 58 years. The conduction defect was noted as early as the eleventh day and as late as the forty-third day of the disease; it usually lasted only a few days. In only two cases were changes noted in the T wave of the electrocardiogram.

HYPERTHYROIDISM. Andrus reports the occurrence of congestive heart failure in 26 per cent. of eighty-six cases of hyperthyroidism studied. He found that under 40 years of age myocardial insufficiency with hyperthyroidism is far less common than in later years. Moreover, when it appears in younger persons cardiac decompensation is almost invariably associated with rheumatic or, more rarely, syphilitic heart disease.

BERIBERI. On the basis of a seven year study of this condition in Java, *Aalsmeer* and *Wenckebach* state that cardiac symptoms are always present, and they emphasize the importance of this fact in the differential diagnosis between beriberi and other forms of polyneuritis, diphtheria being the only other disease in which polyneuritis and such definite and typical cardiac changes are found together. In their experience the clinical picture of the cardiac condition is as follows. (1) Even in the early stages of beriberi the entire heart is enlarged. (2) The enlargement of the heart increases rapidly and is accompanied by decompensation of the right side. (3) The liver becomes much enlarged as a result of congestion, but the lungs remain normal. (4) No form of cardiac treatment produces much improvement. The best diuretics are ineffectual. The eating of food with a high content of vitamin B factor results in a rapid return of the heart to its normal function, form and size.

DIPHTHERIA. Stecher has made a study of the electrocardiographic changes in diphtheria, and reports 19 cases of complete heart block occurring in this disease, all of which terminated fatally. He observes that "heart block in diphtheria probably results from a toxic action upon the conduction system, which renders it functionally inactive, or from an irritation of the ventricular muscle which results in the setting up of an independent ventricular rhythm with a rate faster than that of the auricles. Both effects may occur simultaneously. Some of the effects of diphtheria on the cardiac mechanism simulate closely the toxic effects of digitalis." In a second communication the same author reported six cases with delayed intraventricular conduction, two of whom died and the other four recovered with return of the electrocardiogram to normal.

DIABETES. Morrison concludes from a study of 324 diabetic patients varying in age from 2 to 81 years that "the incidence of vascular calcification increases with age and with the duration of the disease, and is higher in diabetic than in nondiabetic patients. The degree of the calcification increases as a rule with age and duration. The blood pressure in this series of diabetic patients increased with age but not with duration. Roentgen examination is an accurate method of judging the presence of calcium in the vessel walls. It is more reliable than clinical methods in the diagnosis of vascular calcification. Roentgenograms of the extremities would be helpful to insurance physicians. Diabetes mellitus is an etiologic factor in the production of vascular calcification."

TRAUMA. Kahn and *Kahn* have reported a number of cases illustrating the fact that with or without injury to the ribs, an external blow may produce serious injury to the intrathoracic structures. The pericardium may react to a contusion or concussion of the chest with the development of acute pericarditis. Auricular fibrillation may follow direct violence to the chest, or an extrasystolic arrhythmia may arise. Cases of heart block from direct injury of the chest have been reported; rupture of one or more valvular cusps, a dissecting aneurysm, or even rupture of the heart may occur. *Petersen* has reported the interesting case of a 26 year old man who attempted to commit suicide by driving a brass pin into his heart. Repeated x-rays showed the foreign body present; however, the physical condition remained good until suicide 18 months later. Autopsy revealed the pin piercing the wall of the left auricle, and about the foreign body was an organized mass protruding into the left atrium.

THROMBOSIS. Strauss reported the case of a young adult who developed a thrombosis of the superior vena cava following an attack of influenza. Gradually the signs and symptoms of congestion disappeared and his general condition was fair until he died 10 years later of a general peritonitis secondary to a ruptured appendix. Autopsy showed an obliteration of the

superior vena cava and its branches, but an adequate collateral circulation had developed. *Feller* has added another case of thrombosis of the inferior vena cava which caused a temporary, severe swelling and cyanosis of both legs. An adequate collateral circulation developed and the signs of obstruction subsided. Five years later the patient died at the age of 62 years of carcinoma. Autopsy revealed the old and partly calcified thrombosis of the inferior vena cava.

POISONING. The gross and microscopic observations are described by *MacMahon* and *Weiss* in an unusual case of carbon tetrachloride poisoning in which the blood in the right side of the heart and larger pulmonary arteries contained an extremely high percentage of fat (60 per cent.) and macroscopic fat droplets. Fat droplets that were small enough to pass through the capillaries of the lung and gain entrance into the capillaries of other organs produced no microscopic lesions in the heart, brain or kidney. The severe injury to the liver was the probable source of the fat in the vascular system.

TUBERCULOSIS. Adams adds another case of tuberculosis of the aorta to the nineteen cases recorded in the literature. The aorta was involved by extension from a tuberculous process outside the aorta, and the involvement extended to the media, but no rupture occurred. Clinically, luetic aortitis was suspected because of the history, dyspnea, pain, pallor, and a positive Wassermann reaction.

SURGERY. Sprague has analysed the results of surgery on 170 cardiac patients during the past ten years at the Massachusetts General Hospital. Of the 170 patients in this series, 42 died during or following operation, a gross mortality of 24.7 per cent., but only 5 patients died suddenly on the operating table. Upon further analysis of the deaths following operation it was found that only 13 per cent. of the total series died from causes directly referable to the heart, although cardiac disease may have made some of the others more susceptible to pathological conditions from which they died. The conclusions drawn from this study showed that age was the most important factor in mortality; two-thirds of the deaths occurred in patients over the age of 50. It was found that patients with rheumatic heart disease and normal rhythm without congestive failure could be operated on with little danger, and that cardiac patients, excepting those with syphilitic aortitis or advanced coronary disease, are not likely to die suddenly during operation; the cardiac patient succumbs generally to complications or heart failure during the postoperative period. The presence of auricular fibrillation increased the danger of death from operation in arteriosclerotic cases only from 34 to 37.5 per cent., but in a small series of rheumatic heart cases from 8.8 to 22.2 per cent. Thyrocardiacs with auricular fibrillation did better with operation for the thyroid hyperfunction than any other group with this arrhythmia. From his experience the author is inclined to believe that so long as surgeons consider cardiac patients "especially unsafe," their future in the hands of the surgeon is relatively bright.

EXERCISE. The question of the effect of exercise on the size of normal hearts remains unsettled. *Herxheimer,* to determine whether the heart in athletes is larger than in other persons, made a roentgenological examination of 196 participants in the Olympic games at Amsterdam, and he states that the hearts of persons outstanding in the more strenuous sports are larger than those of other persons, even if their weight and physique are the same, and he asserts that these findings confirm the observations which he made upon the participants in the German sport contests in 1922. However, *Farrel, Langan* and *Gordon* made a roentgenographical study of a group of long distance runners and, according to the so-called cardiothoracic ratio, only one heart was increased in size. The data as a whole suggest that the immediate effects of long distance running are inconsequential.

An interesting study has been made by *Herrmann* on a group of 16 race horses of various strains, ages, and racing experiences and he has been able to obtain the heart-weight body-weight ratios and the left ventricle to right ventricle ratios. An analysis of the data suggests that the thoroughbred race horse has a larger heart to begin with and one that has a greater capacity for hypertrophy than the regular run of horses. The heart, furthermore, apparently responds to schooling and training by hypertrophying to an unusual degree. It was pointed out that the race horse averages were far below those that were reported in a series of greyhounds by the same author 3 years ago. The question is again raised of attributing the findings to the inheritance of acquired characteristics or to the result of selection down through generations of racing stock.

IV. Symptoms and Signs

Palmer and *White* studied a group of 250 cases of cardiac asthma found among 3,100 hospital and private patients with organic heart disease, an incidence of 8 per cent. The grave prognostic significance of the condition is shown by the fact that 170 of the 250 patients are known to have died, with an average duration of life of 1.4 years after the first attack. The relative highest incidence occurred in syphilitic heart disease (21 per cent.) and in chronic nephritis (19 per cent.). The frequency, duration, and severity of the attacks altered the prognosis only when of extreme degree. The coincidence of poor heart sounds, gallop rhythm, and pulsus alternans indicated as a rule, a very short life. In therapy, digitalis and rest were generally effective in reducing the number of attacks and apparently in prolonging life; for

the acute attacks nitrites and alcohol were sometimes helpful, but morphine was of the greatest value.

White and *Hahn* have made a study of the symptom of sighing and its relation to cardiovascular disease. They found it present in normal individuals, but it is frequent in only occasional cases (19 per cent. of 400 young normal people), except in young women in the third decade where it was present in 33 per cent., and it is rarely excessive in normal individuals. Frequent sighing was found not to be a symptom of heart disease even in the presence of well marked congestive failure (3 per cent.), but a common condition in neuro-circulatory asthenia without heart disease (80 per cent. of 100 cases). From their observations it was concluded that frequent or constant sighing is a symptom of nervous origin, not dependent on disease of heart, lungs, kidneys, or thyroid gland, and when present one should determine the degree of responsibility of the nervous system in the production of a state of ill health that may exist.

Page reported two cases of congestive cardiac failure following hemiplegia in whom edema was present on the paralyzed side and jaundice on the opposite side.

Granstrem described a new percussion sign in cardiac decompensation. He claims to have observed in many cases of decompensation the appearance of dullness on light percussion in the first intercostal space, extending from three to four finger breadths to the right of the sternum and from one to one and one-half to the left, caused by a dilatation of the superior vena cava and innominate veins and by edema of the mediastinum, as revealed by röentgenologic examination and verified at necropsy. It decreases after bloodletting, and increases on pressure over the liver during the act of percussion, and gradually disappears with amelioration of the symptoms of cardiac decompensation.

Eggleston has discussed the persistence of a mitral stenotic murmur in the presence of auricular fibrillation and suggests that the apparent presystolic murmur heard when the auricles are fibrillating is the continuation of a long murmur beginning earlier in diastole. The termination sometimes seems crescendic due to an auditory illusion produced by merging of the rough murmur with a loud, sharp first sound. It is a valuable diagnostic and prognostic sign, being found only in the presence of a markedly stenosed valve. A murmur limited entirely to presystole, leaving the remainder of diastole free, has not been heard in the presence of auricular fibrillation in a large series of patients examined by the author.

The clinical types of edema in the heart failure of childhood have been studied by *Bachmann* who has pointed out that "(1) Edema in the child with cardiac disease manifests itself in two types: the dependent or cardiac type and the generalized or nephritic type. (2) Response to treatment has shown a certain specificity which is of clinical value. In the dependent type digitalis is of value, while the addition of the milder diuretics aids little in hastening reabsorption and elimination. If digitalis fails, then the stronger mercurial diuretics are necessary. In the generalized type of edema, theobromine sodiosalicylate acts almost as a specific and usually without the aid of digitalis. (3) In the generalized type, there is a definite clinical picture produced during diuresis which is characterized by toxic symptoms such as headache, nausea and rise in temperature. In the dependent type of edema these symptoms never occur during diuresis. (4) The type of lesion of the heart seems to influence little the kind of edema produced. It appears, however, that in the children whose history of heart failure is of recent date and whose hearts are, perhaps, still acutely infected, the edema associated with failure is more likely to be generalized. Dependent edema occurs almost exclusively in the patients with more chronic heart disease. (5) The prognosis for the patient with generalized edema is good, at least as to the immediate future, while that of the patient with the dependent type of edema is relatively bad. (6) It is suggested by the clinical observations of two type of edema seen in heart failure in childhood that different factors are at work in each."

V. X-Ray

Thibaudeau and *Mattick* have studied microscopically hearts exposed to radiation in the course of treatment of malignant neoplasms in their immediate vicinity and they have found that definite injury to the heart muscle may result. The pathological picture in the cases studied varied from slight interstitial fibrosis to hyaline and fatty degeneration of the muscle fibers with necrosis. *Warthin* and *Pohle* exposed a series of rats and rabbits to roentgen rays three times at monthly intervals, the dosage being 600 R the first time and 300 R each succeeding time. The animals were killed from eight to thirty-two days later, and in every animal definite lesions were found in the myocardium, consisting essentially of marked Zenker's necrosis and fatty degenerative infiltration. They suggest that caution be used in any case in which the treatment brings the heart in the path of the rays.

Campbell concluded from a stereoscopic study of 100 hearts whose coronary arteries had been injected with an opaque solution of barium that the method is of much value in demonstrating the cardiac lesions which come to autopsy. The changes and anastamoses previously described by Gross have been verified, and he finds that the neuro-muscular tissue is specially safeguarded by many alternative channels of supply. In two of the series even stenosis of the specific artery to the node and bundle failed to give any electrocardiographic evidence of a lesion.

Keefer and *Hsieh* found the heart enlarged in all cases of beriberi with cardiac insufficiency which they examined roentgenologically. There was considerable enlargement in some patients without definite cardiac insufficiency. The enlargement they found to be principally right-sided, involving the right auricle and ventricle, and the pulmonary artery was quite prominent in many. There was enlargement in the region of the superior vena cava, and this shadow diminished with the decrease in the size of the right auricle. The size and configuration of the heart changed completely following treatment, and assumed a normal size and shape after varying length of time.

VI. Electrocardiography

Barker, Macleod, Alexander, and *Wilson* have made some very interesting observations on the exposed human heart of a young man upon whom a pericardiostomy was performed to relieve a treptococcus pericarditis which followed a streptococcus pneumonia. The heart was exposed for three weeks and it was during the early part of this time that the observations were made. By taking direct leads from the surface of the ventricles and by producing ventricular extrasystoles with electrical stimulation, they obtained curves which are in complete disagreement with the generally accepted view; that is, the curves obtained from the right ventricle are of the type previously considered to be of left ventricular origin, and those obtained from the left ventricle are of the type previously supposed to be of right ventricular origin. It would seem from these experiments that the human electrocardiograms which have previously been called right bundle branch block are in reality left, and vice versa.

Lundy and *Woodruff* produced right and left axis deviation of the electrocardiogram in the intact dog under ether anesthesia by distention of the respective ventricles, and they have discussed the possible importance of these and similarly acting factors as a mechanism for clinical changes noted in the electrocardiogram.

White and *Mudd* studied the duration of electrical systole in a large number of cases by the use of the Lucas comparator. They found the normal duration at a heart rate of 50 to be 0.48-0.30 seconds, and at a rate of 150 to be 0.262-0.214 seconds. Twenty-two cases showed overlong Q-T intervals, and eighteen of these showed either bundle branch block, very slow rates as in complete heart block, very fast pulse rates as in auricular or ventricular paroxysmal tachycardia, ventricular premature beat complexes, or a too low content of calcium in the blood serum. Of pathological conditions, enlargement, aortic regurgitation or stenosis, mitral stenosis, congenital cardiac defects, hypertension, hyper- and hypothyroidism, congestive failure, auricular fibrillation, and low voltage did not affect the Q-T interval, the measurement of which is of little or no clinical value.

Esler and *White* have discussed briefly the more important artefacts in electrocardiograms that have come to their notice in the past 13 years. They divide them into two groups, according to whether they are intrinsic or extrinsic in origin. The former may arise from single contractions or movements of skeletal muscles, from repeated contractions of such muscles (tics), from paralysis agitans, and finally from tension of muscles constantly in contraction, as in nervous or hyperthyroid persons. Artefacts of extrinsic origin include those due to high resistance, polarization of electrodes, outside current, faulty contacts, reversed leads, composite electrocardiograms, and errors in photography or in manipulation of the time marker.

Levy and *Turner* followed a series of cases of rheumatic fever in which frequent electrocardiograms were made, and about 27 per cent. of the cases showed a prolonged auriculoventricular conduction. They found that a disturbance of the A-V conduction was more frequent in rheumatic fever than in any other disease, and that an impaired conduction was next most frequent in arteriosclerotic and hypertensive heart disease. They concluded that a prolonged P-R interval, or heart block, in a person less than 35 years of age, without lues and who has not taken digitalis, is presumptive evidence of rheumatic carditis.

Davis and *Sprague* report a case of rheumatic heart disease with syncopal attacks and death with the clinical, electrocardiographic, and autopsy observations. The electrocardiograms taken during unconsciousness showed the mechanism to be a probable circus movement in the ventricles of the nature of flutter or fibrillation associated with auriculo-ventricular dissociation and auricular fibrillation or standstill. The patient had received both digitalis and quinidine sulphate in moderate doses. On theoretical grounds the use of quinidine to restore normal rhythm in auricular fibrillation would seem to be safer when it is not administered in combination with, or directly following, digitalis, and this conclusion was felt to be more definite when intraventricular block was present.

Esler and *White* studied a series of 100 cases of premature beats which they divided into four heart rate groups, and followed over a period of years, together with a control series of 100 cases with normal rhythm and similar heart rates. Premature beats which occurred at the more rapid rates did not bear a more serious prognosis than those at slower rates when allowance was made for the increase in mortality due to the increased rate alone, and the presence of premature beats in the series reported did not add gravity to the prognosis. Auricular premature beats were not found to be more significant so far as prognosis of life is concerned than were ventricular premature beats. The frequency with

which premature beats occurred in a given case seemed to bear little relation to prognosis.

VII. Other Methods

Forssman points out that in cases of cardiac collapse an intracardiac injection is often the only means by which the patient can be saved. He believes that the present methods of making injections directly into the heart often cause serious complications and even death. These considerations induced the author to find what he considers a less dangerous method, and he attempted a catheterization of the right heart by way of the venous system. His first experiments were made on cadavers; later he succeeded in performing catheterization on himself. Under local anesthesia a venesection at the left elbow was performed and a number 4 Charrière ureteral catheter, which had been kept in sterilized olive oil, was introduced into the cephalic vein for a distance of 65 cm. so that it passed into the right auricle; the position being clearly shown by x-rays. During the procedure there was no pain; only a sensation of warmth similar to that felt following an intravenous injection of calcium chloride. He further describes the case of a patient with suppurative peritonitis and circulatory collapse who was given intracardiac medication by this method with some temporary relief, but the patient soon died, and necropsy revealed that the catheter had reached the right atrium. The author stresses the significance of the method in the treatment of cardiac collapse and in complications resulting from anesthesia, and indicates its possibilities for metabolic researches on the action of the heart.

Koch and *Simon* have made continuous records of the blood pressure in man by using a small rubber balloon filled with water connected by means of a tube to a manometer inserted into a partly closed hand out of which the blood has been forced in the manner described by Wiersma. The hand of the patient is then enclosed in plaster of paris. The obstruction to the flow of blood to the hand is then removed and, because of the rigid system in which the hand is enclosed, the entering blood can act only on the rubber balloon and the attached manometer. The blood pressures obtained by this method are from 5-10 mm. lower than the values with the Riva-Rocci sphygmomanometer.

VIII. Pharmacology

Cloetta has written an excellent summary of the present views as to the composition and actions of the various constituents of digitalis. Digitoxin is perhaps the most potent of the various glucosides, and in outlining its action he points out that after it is fixed to the muscle substance, the reaction is an irreversible one. It is later split by living protoplasm into a genin and a sugar and these are less firmly bound and are slowly eliminated from the organism. Since it follows Van 'T Hoff's law the reaction is considered a physical rather than a chemical one. Among the extra-cardiac effects of the drug, the author mentions the specific action on the autonomic system giving rise to gastric and other disturbances; its stimulating effect on the pancreas; the kidneys are stimulated directly as well as through the circulation; and, finally, it causes an outflow of alkaline bodies from the tissues.

Straub has discussed the biological digitalis problems, and maintains that the action of digitalis in abnormal hearts as compared with normal hearts is due to slower blood flow through the heart and a larger absorbing surface in large hearts. In 60 seconds of exposure of a heart to digitalis an irreversable fixation of the drug in the muscle occurs which may not show its effect for hours afterward.

Hanzlik has described a new method of estimating the potency and the probable therapeutic dosage of digitalis by determining the minimum emetic dose in pigeons. The author considers the method simple, easy, convenient, economical and reasonably accurate. If desired, the determination of the minimal emetic dose may be supplemented by the determination of the minimal fatal dose in the same pigeons, and from the ratio of these two, an idea of the margin of safety in digitalis preparations may be obtained.

Bromer and *Blumgart*, by means of the electrocardiogram, have studied the maintenance dose of digitalis in man, and found that the average was 23.5 minims. The maintenance dose seemed unrelated to weight or degree of circulatory compensation. The earliest definite alteration of the T-wave occurred when 55 per cent. of the therapeutic dose was within the body. It was felt that changes in the T-wave could be used as a quantitative index of the amount of digitalis effective within the body. The earliest effect was seen in one case 6 hours after administration of the drug by mouth. The most obvious changes noted were those in the T-wave, depression of the S-T or R-T interval below the iso-electric point, lengthening of the P-R interval, slowing of the rate, and inversion of the P-wave in some cases.

Gold and *DeGraff* made a study of digitalis elimination in ambulatory cardiac patients and they present evidence which they believe indicates that a patient does not eliminate a fixed quantity of digitalis, but merely a percentage of that which is present in the body at the time.

Feil and *Steuer* investigated the digitalis tolerance of patients with renal insufficiency, and in ten patients with glomerular nephritis studied they found that the amounts of digitalis necessary to alter the T-wave of the electrocardiogram were no less than cardiac patients usually require. This observation was also confirmed clinically.

Six specimens of powdered digitalis were ex-

amined by *Haag* and *Hatcher* after intervals varying from one to sixteen years, and in no case were they able to detect any evidence of deterioration. They found that "the official tincture of digitalis retains its activity with comparatively little change during several years, and that any change that does occur merely calls for a corresponding increase in dosage. The secret of deterioration of liquid preparations of digitalis has not been explained fully, and there is no evidence that any of these preparations are as stable as powdered digitalis kept with ordinary care in a corked glass bottle. Aqueous solutions of strophanthin, ouabain or other digitalis principles, kept in ampules of soft glass, deteriorate rapidly." "Our investigation lends no support to the contention that any of the digitalis specialties mentioned are more stable than the official digitalis tincture."

Hückel and *Wenzel* have studied the changes in the arteries following the oral administration of viosterol (irradiated ergosterol) to rabbits in total doses of from 9 to 700 mg. within one to three weeks. The animals lost weight and nearly all of them died spontaneously. Microscopic examination of the arteries of rabbits which had not received more than a total of 20 mg. revealed deviations in the first portion of the aorta; those receiving 50 to 70 mg. showed a thickened ascending aorta and a roughening of the inner surface which contained hard plaques projecting into the lumen. In the animals which had received from 100 to 200 mg. of viosterol the process involved the entire aorta, and with even larger doses the aorta had been converted into a rigid tube. Compared with these changes in the aorta, the changes in the large arteries were unimportant. Microscopically, calcification could not be demonstrated in animals which had received 12 mg., but marked changes in the media were noted, large vesicular cells which did not contain fat were present. The pathological process was shown to have begun, also, in the media of the arteries of the kidneys. The authors emphasize the fact that only minute quantities of viosterol were required to produce marked injury of the wall of the aorta and of the arteries of the kidney.

Scherf and *Zdansky* examined roentgenologically the heart in normal persons before and after the administration of various drugs. They concluded that: (1) The intravenous injection of 0.002 gm. of atropine caused a decrease in both the systolic and the diastolic diameters of the heart. (2) Epinephrine intravenously resulted in a decrease in size of the heart in 50 per cent. of the persons examined, and in none was enlargement observed, in spite of the fact that the blood pressure of one of them rose to 210 mm. of mercury. (3) The inhalation of amyl nitrite was followed by a definite diminution in the size of the heart.

IX. Treatment

A. Medical

Digitalis

Schwartz and *Weiss* studied the results obtained from the administration of a single body-weight dose of digitalis to twenty-four children with chronic rheumatic valvular heart disease and signs of heart failure. There were no untoward symptoms from the administration of the drug in a single dose of this type provided it was well diluted with water. Eighteen of the children were studied during both the active and the inactive phases of rheumatic fever, twelve of whom had sinus rhythm, while auricular fibrillation was present in five. No electrocardiographic signs of digitalis action were observed in six, while in the remaining cases, the alterations consisted essentially of a lowering of the S-T segment below the iso-electric line with final progressive increases in the negativity of the T-wave in one or more leads in which it was previously upright. A transient slowing of the sinus rate of between 10 to 15 beats per minute was noted in those with sinus rhythm, while the same dose given to those with auricular fibrillation reduced a ventricular rate from an average of 157 beats per minute to 60 beats within 24 hours. The electrocardiographic changes were very variable and it was concluded that the changes shown could not be taken as criteria in measuring the standardization of the drug, its rate of absorption and elimination, or the maintenance dose.

Schwartz asserts that digitalis in therapeutic doses may be of great benefit to patients with complete heart block and heart failure, due to the direct action of the drug on the heart muscle. However, he believes it advisable to have such patients under careful graphic control, since otherwise, it is difficult to appreciate the various types of toxic rhythms that may appear under digitalis therapy.

Quinidine

Wolff and *White* have made a clinical study of the effect of quinidine sulphate in 62 cases of permanent auricular fibrillation, 8 cases of permanent auricular flutter, 29 cases of paroxysmal auricular flutter, and a small group of cases with paroxysmal tachycardia and premature beats. They also present a follow-up study of a series of 75 additional cases of permanent auricular fibrillation and flutter reported in 1923. In the series of 70 cases, comprising 62 of auricular fibrillation and 8 of flutter, normal rhythm was restored in 65.7 per cent. In apparently normal hearts permanent auricular fibrillation was terminated by quinidine in 100 per cent. of the cases. The next most responsive group was that of patients with rheumatic heart disease who are less than 41 years of age. There was one death which might possibly be attributed to quinidine, but probably was not due to it. Con-

clusions arrived at from this study were that quinidine was of value in preventing and terminating paroxysmal auricular fibrillation, and was effective in some cases of paroxysmal tachycardia and premature beats. In cases of auricular flutter, digitalis is probably more effective than quinidine, and appears to be more effective in occasional cases of paroxysmal auricular fibrillation and paroxysmal tachycardia.

The same authors have recorded two cases of probable auricular standstill of a few hours' duration associated with quinidine therapy for auricular fibrillation.

Harris has reported a series of forty-three cases of chronic auricular fibrillation treated with quinidine; the arrhythmia was abolished and normal rhythm restored in twenty-six. In these twenty-six cases the rhythm remained normal for one month in 65.4 per cent., for six months in 57.7 per cent., and for twelve months in 36.0 per cent. In one case the rhythm remained normal for seven years, and then fibrillation recurred.

Levine and *Fulton* concluded from their clinical experience with ten cases showing ventricular tachycardia that quinidine sulphate has in most instances a specific effect in restoring a normal rhythm, and may be a life saving measure, especially in those cases in which the abnormal rhythm follows a recent coronary thrombosis. They feel that the ventricular tachycardia is probably of the nature of a circus movement similar to that of auricular flutter and fibrillation, and that the action of quinidine is analogous in all these conditions.

Potassium Sulphocyanate

Palmer, Silver and *White* have reported their results in the treatment of 59 cases of essential hypertension, using potassium sulphocyanate in doses of 1½ grs. three times a day for the first week, twice a day for the second week, and once daily thereafter. Usually one course of three or four weeks on this schedule has been employed before omitting the drug. A reduction in the systolic pressure of 30 or more millimeters of mercury occurred in 42 per cent. of this series, and possibly favorable effect in a larger percentage. The drug should be used with care in patients with renal changes, or with coronary sclerosis. The authors are contemplating further studies to determine whether this therapy is of permanent value and if so, in what type of case.

Certain untoward symptoms are occasionally noted when the blood pressure of patients with hypertension is lowered. *Palmer* and *Sprague* have presented four patients who were definitely less comfortable when their blood pressure was reduced by potassium sulphocyanate therapy. In two of them the drug caused uncomfortable weakness, while in the remaining two it appeared to produce angina pectoris. The symptoms in the patients reported seem to have been due to the lowering of the blood pressure rather than to any toxic effect of the drug, which is in many instances a useful therapeutic agent.

Cucurbocitrin

Althausen and *Kerr* have treated a series of hypertensive patients with watermelon seed extract (cucurbocitrin). A capsule containing 50 mg. of the glucoside was given three times a day as an optimum dose. The immediate effect of a single dose in hypertensive cases was a fall in the systolic and diastolic blood pressure, the extent and duration of this fall being roughly proportional to the dose in the same patient. After prolonged administration in forty cases of hypertension, it was found that a reduction of the systolic pressure in these cases was 29 mm. of mercury and of the diastolic pressure 15 mm. Thirty-nine cases had symptoms directly referable to the hypertension; 82 per cent. of these obtained definite relief. No untoward effects or signs of tolerance to the drug were observed, and the effects of prolonged administration lasted after the drug was stopped from one to four weeks in 11 cases, and from one month to five months in 8 cases.

B. X-RAY

Lian and *Barrieu* have employed roentgen-ray therapy for the relief of pain in angina pectoris. In some cases the patients were relieved after the first treatment, but usually improvement was not noted until after the fourth or fifth treatment. Some patients were able to walk rapidly without exhibiting the least disturbance. During the first treatments, some exacerbation of the anginal pains may be feared, but in the authors' cases this occurred rarely and was slight. If these exacerbations appear, roentgen therapy must be discontinued. The authors believe the heart muscle is not injured by the treatment.

C. SURGERY

White has written an interesting paper on the relief of pain in angina pectoris by paravertebral alcohol block of the upper dorsal sympathetic rami, and the clinical results in eleven cases from the cardiac clinic of the Massachusetts General Hospital are reported. In this series, in 72.8 per cent. the results were considered good; namely, from 50 to 100 per cent. relief of pain, 9.1 per cent. were improved, while 18.1 were considered failures. In conclusion the author states that "as in a successful sympathectomy, the best one can do for the patient is to rid him of pain; one cannot thereby restore the diseased heart to normal. Granted these limitations, the more I have seen of injections of alcohol, the more confident I have become that this is a logical and safe method of treatment in severe forms of angina pectoris. The method in its present status gives promise of being distinctly less dangerous and of giving results as good, if not bet-

ter, than sympathectomy." *Cattell* and *Hurxthal* have added another successful case of paravetebral alcohol block for angina pectoris. Their patient was relieved of practically all pain for five months and was able to work steadily during this time, until a terminal coronary thrombosis proved fatal.

Churchill has reviewed the literature as to the surgical procedures that have been employed in cases with adherent pericardium, and has reported the first successful case in America in which a decortication of the heart (Délorme) for adhesive pericarditis was performed. The patient, age 18 years, had been more or less a chronic invalid for the preceding 10 years because of dyspnea, edema, and ascites. The heart was somewhat enlarged with a systolic murmur at the apex, the liver edge was felt 6 cm. below the costal margin, and the cervical veins were slightly engorged and pulsating. Digitalis produced no definite change in the condition of the heart. She was under observation for about 3 years in the Cardiac Clinic of the Massachusetts General Hospital with a slowly progressive downhill course, and there seemed to be little doubt that pericarditis must be the cause of her trouble. Operation was performed under ether anesthesia, the costal cartilages of five ribs, a portion of the sternum, and a V-shaped section of the diaphragmatic pericardium including an adhesive band were removed, and adhesions about the vena cava were freed. Convalescence was without notable incident, the edema of the extremities rapidly subsided, and a considerable diuresis was noted. The patient gained strength rapidly and was discharged from the hospital one month after operation. Eight months later she was able to walk four miles a day without shortness of breath, and thirteen months later she continued in excellent condition, leading a normal life in every way.

Graham reported two cases in which operations were performed for the purpose of decompressing hearts that were embarrassed by confinement within a rigid bony chest wall. One patient, aged 14 years, had frequent attacks of cardiac decompensation following acute rheumatic fever; and the second, aged 5, had cardiac decompensationn following several attacks of rheumatic fever. Both operations were done under local anesthesia, the fourth and fifth ribs and costal cartilages, including the periosteum and perichondrium, were removed from the left border of the sternum to the anterior axillary line. There was considerable immediate subjective improvement in both patients; the first stated that the palpitation and sense of pounding in the precordium disappeared entirely, while the second showed an equal amount of subjective improvement, and in addition the venous engorgement of the cervical veins soon subsided. The author concludes that "in neither case were the ordinary indications for the Brauer operation of cardiolysis present, such as positive evidence of a tethering of the heart by adhesions. For this reason, therefore, the beneficial results seem to have been due entirely to the effect of a decompression."

Leriche and *Fontaine* have given a report of two cases illustrating the possibility of occurrence of a complex of symptoms following sympathectomy, and they call attention to the fact that the formation of neuromas constitutes the reason why results that were originally good, eventually become less marked or are followed by the development of a disorder topographically different but, on the whole, of the same character as the one for which the original operation had been done. Of the two patients, the most interesting was a woman, 34 years old, who had been operated upon for angina pectoris. Several months later the symptoms of the disease returned. Examination of the scar revealed the fact that dense adhesions had formed, and resection of these gave relief, and eight months later she was in good health. Microscopic examination showed the excised tissue to be a neuroma. The second case was similar in that a second operation with the removal of neuromas brought relief.

Adson and *Brown* have discussed the treatment of Raynaud's disease by resection of the sympathetic trunks. They report a case in which complete relief followed resection of the sympathetic cervicothoracic and second thoracic ganglions, the intervening trunks, and later abdominal bilateral transperitoneal sympathetic ganglionectomy and ramisectomy. The physiological studies gave ample quantitative data to verify the improvement in the clinical condition. They conclude that the results obtained in the upper extremities by this procedure are comparable to those obtained with removal of the lumbar sympathetic ganglions in the lower extremities. Failures are due to incomplete division of the vasoconstrictor fibers supplying the peripheral circulation of the extremities.

Kantor performed successfully an embolectomy on the axillary artery in a woman, aged 51 years, who sixteen days following an operation for myoma of the uterus suddenly felt a severe pain in the right arm, and the arm appeared pale, cool, and no pulse was discernible. The operation was performed two hours later, and recovery was uneventful. The author considers not more than ten hours after the manifestation of the first symptoms as the latest point of time at which embolectomy will still be helpful.

X. Social and Economic

The United States Department of Commerce has announced that the death rate for the registration area of the United States for 1928 was 12 per thousand of population, as compared with 11.4 in 1927. In the list of increases in rates for the year heart disease leads, followed in order by cerebral hemorrhage and softening, nephritis, diabetes mellitus, cancer, influenza

and pneumonia. The deaths from these six conditions account for considerably more than half of the total number of deaths which occurred in the registration area in 1928.

Cohan has studied the incidence of heart disease in 10,333 children in the public schools of Philadelphia with an aggregate enrolment of 11,578 pupils, and has reported a general incidence of organic heart disease of 0.91 per cent. The younger children had a slightly lower incidence of heart disease than the older pupils and the boys were similarly favored over the girls. Mitral stenosis was the most frequent lesion found and this anatomic diagnosis was made in fifty-three of the ninety-four children with heart disease. Fourteen of these fifty-three showed signs of mitral stenosis and mitral insufficiency. Consideration was also given to three additional factors bearing on the prevalence of heart disease in school children; namely, (1) children with grave heart lesions, unable to attend any school; (2) children with crippled hearts attending special classes, and (3) children with definite or suspicious heart lesions that are being overlooked because of the inadequate routine examination of the clothed chest.

In a symposium on certain aspects of chronic heart disease, *Upton* has pointed out that the adjustment of home problems stands out as one of the most challenging as well as one of the most hopeful problems presented. The author discusses the various phases in the home that require adjustment in order for the patient properly to meet his daily needs and life. How these home adjustments are to be made is a matter of technic which varies with the individual worker, the individual patient and the problem. The various questions arising in the care of young children with heart disease, as well as those during adolescent life have been presented by *Terry*, and the need for supervision in the school, in the home, in outside activities and preparation for vocational occupation is discussed. Various types of work suitable for male cardiac patients have been enumerated by *Raymond*, and stress has been laid on the necessity of an intimate relationship between the placement worker, the hospital social service worker, and the employer.

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CASE RECORDS
of the
MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICAL-PATHOLOGIC EXERCISES

EDITED BY RICHARD C. CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASE 16381

ABDOMINAL PAIN OF EIGHT HOURS' DURATION

MEDICAL DEPARTMENT

PRESENTATION OF CASE

DR. GILES W. THOMAS*: This patient was an American spinster seventy-four years old who entered the Emergency Ward on June 21 complaining of lower abdominal pain of eight hours' duration.

She gave a history of rather atypical anginal attacks consisting of a sense of constriction and suffocation in the throat and perhaps some radiation in the arm for the past three years. She was known to have had hypertension for several years, just how long is uncertain.

Dr. Burrage was called in to see her at eleven o'clock the morning of admission and was told that at nine o'clock she had sudden abdominal pain. She had five or six bowel movements, not diarrhea, and vomiting. Since that time the bowels had not moved. At the time he saw her the belly was flat, soft, not tender. The heart rate was rapid, about 100 perhaps. Chest clear. Her niece had also had abdominal pain at the same time, and there was some question as to whether she and her niece had had the same things to eat that night. But it turned out on further investigation that they had not. Acute food poisoning or an atypical coronary attack were the things thought of. Dr. Burrage gave her one-quarter grain morphia at the time and came back to see her at three o'clock in the afternoon. He found her unrelieved by morphia. This time the abdomen was moderately distended, still not particularly tender, chest filling up with râles. The pulse was fairly rapid, about 120, with numerous extrasystoles.

She was sent in to the Emergency Ward, where she showed what has been described with the addition of extreme cyanosis with rapid shallow breathing, blood pressure 190. The blood pressure when she was seen in the morning had been 220. She was admitted to the ward and given morphia to keep her comfortable. During the afternoon the blood pressure gradually fell to 110 by evening. She had no more bowel movements. She complained almost continually of pain in spite of one-quarter grain doses of morphia every three hours, enough morphia to bring the respirations down to 15 by evening. The abdomen became more and more distended. The pulse came down to 100 and did not seem so irregular.

The following morning she seemed better so far as the general condition went. She was better able to talk, was not so cyanotic, pulse fairly regular at 100. But the abdomen was tremendously distended and very tender; whenever we touched her or made a motion as though going to touch her she screamed. The leukocyte count was 30,000, the red count 7,500,000. During the day she grew steadily worse. The blood pressure gradually fell so that by evening it was 90 to 100. She had had a great deal of morphia, so that the respirations got down to 10 or 11. The abdomen became more distended. She had no bowel movements. During the evening she began to have fecal vomiting. The pulse went up to 120 or 130, with more or less irregularity. Apparently the chest was clear. At this time as at entry we were not able to examine her back. She died at six o'clock in the morning of June 23, the second day after entry. The leukocyte count had increased to 36,000 at that time.

*Resident on the East Medical Service.

CLINICAL DISCUSSION

BY RICHARD C. CABOT, M.D.

Anyone of this patient's age who has an attack of abdominal pain lasting eight hours should be suspected to be in a serious condition, intestinal obstruction being the possibility first to be considered. As this patient's pain is in the lower abdomen it does not seem at first probable that it has direct connection with her anginal attacks. The fact that the pain was preceded by vomiting and by several bowel movements makes the possibility of intestinal obstruction still more real, but acute general peritonitis is also to be considered.

In the physical examination the cyanosis, the râles in the chest, the rapid pulse and the high blood pressure give us the impression that the condition of the heart is at least as important as that of the abdomen. But later, when the abdomen becomes distended and very tender, when the leukocyte count has risen to 30,000 and the blood pressure has fallen so low, one could have no further doubt that the cause of her serious symptoms is in the abdomen.

The two diagnoses already mentioned are still the most important, but as a cause of the intestinal obstruction we must consider mesenteric thrombosis, which in a person of her age and with the arteriosclerosis which may be presumed to exist is always an important possibility when acute abdominal symptoms arise. In the absence of any previous history relating to bowel trouble or to any disease of the abdomen, it seems to me that a mesenteric thrombosis with intestinal infarction is the most probable diagnosis. Acute

general peritonitis at her age and without any previous indications of its cause is not common, but cannot be excluded in this case. If there is a peritonitis it may very possibly originate in intestinal obstruction due either to the cause already mentioned or to cancer. In the latter condition perforation of the bowel above the mass is not uncommon.

If the condition is one of mesenteric thrombosis one naturally inquires the possible origin of the disease. With a heart obviously as weak as this patient shows, an intracardiac thrombosis can usually furnish an embolic cause for a mesenteric block. This intracardiac thrombosis may well be at the site of a cardiac infarct, itself the result of coronary blocking. As this patient has apparently suffered from angina it is quite possible that the sequence of events was as follows:—

Coronary sclerosis.
Coronary block.
Cardiac infarction.
Intracardiac thrombosis at the point of infarction.
Detachment of a fragment of this thrombus, with
Mesenteric thrombosis as a result.

CLINICAL DIAGNOSES

Mesenteric thrombosis.
General peritonitis and intestinal obstruction.
Arteriosclerotic and hypertensive heart disease.
Angina pectoris.

ANATOMIC DIAGNOSES

Mitral stenosis.
Arteriosclerosis of the aorta and the great vessels.
Slight arteriosclerosis of the coronary arteries.
Hypertrophy of the heart.
Embolism and thrombosis of the superior mesenteric artery.

Pathologic Discussion

Dr. Merrill J. King: At autopsy this patient was found to have a moderately enlarged heart with definite mitral disease. The mitral orifice was practically occluded, and there were old healed vegetations on the leaflets. Both cusps were sclerosed and calcified. In the posterior cusps about 7 millimeters from the free margin there was an irregular narrow, eroded, slit-like area of destruction forming an opening about one centimeter long and from two to four millimeters in width. The edges of this perforation were finely nodular. There were two small finely granular areas on the auricular surface of the right anterior cusp. There was slight sclerosis of the coronaries and aorta, with a large calcified plaque in the arch.

The next most interesting findings were in the superior mesenteric artery, where at the origin of the first large branch supplying the jejunum there was a small firm dark red blood clot 1.5 centimeters in length resting against the angle formed by the bifurcation of the vessel. This mass was slightly adherent to the vessel wall and practically occluded the lumina of both the main vessel and the branch. Practically all of the jejunum and portions of the ileum and the ascending colon were dark red and distended and were beginning to undergo infarction. There was about 400 cubic centimeters of serosanguineous fluid in the peritoneal cavity, with fresh fibrinous adhesions between contiguous loops of gut.

The liver was negative. The kidneys showed arteriosclerotic changes.

Dr. William D. Smith: There are two or three rather interesting things about this case. When I saw the patient the morning after she came in it was perfectly obvious that she had some abdominal tragedy, that is perforation, peritonitis or thrombosis. The diagnosis we made of thrombosis of course was guesswork. At her age, with her heart and the tremendous suddenness of the thing it seemed to me the best probability. It happened to be right; but there might perfectly well have been some other abdominal condition.

Another interesting thing was the drop of 100 points in blood pressure in spite of the shock. The heart rate was about 100 and the sounds were fairly good. That seemed a little queer with the lungs full of râles. Even so when we listened to her heart it was a pretty good heart. Why she did not have a rate of 160 I cannot imagine.

The question of coronary thrombosis was brought up on admission. I do not know why she might not have had coronary thrombosis. I have seen the pain of coronary thrombosis maximum in the back, I have seen it maximum in the neck and teeth and I have seen it maximum in the upper abdomen; I have seen it imitate gall bladder very closely; but I have never seen the pain of coronary thrombosis in the lower abdomen.

She was seventy-four years old and had a practically occluded mitral valve and no one raised the slightest question of mitral stenosis. There was no history of congestive failure, the heart was not fibrillating, there was no murmur suggestive of mitral stenosis. Once in a while you see an old person with no past history of cardiac disease and no history of rheumatism who has definite mitral stenosis, and you wonder if a person can have mitral stenosis from an unknown rheumatic infection in childhood, get to be seventy-five or eighty years old with no heart symptoms, then die suddenly and show practical occlusion of the mitral valve. I have always wondered whether there might not be arteriosclerotic mitral stenosis just as there is arteriosclerotic aortic stenosis.

Dr. King: I have a vague recollection that Dr. Karsner of Cleveland has found such an arteriosclerotic condition of the mitral valve. I do not think I have ever seen it or heard of it otherwise.

Dr. Edward L. Young, Jr.: Surgically I do not think there is anything to add. This case is of the type in which surgery offers nothing. As a matter of fact the surgical mortality in mesenteric thrombosis is very high anyway. The only figures I know put it at 94 per cent. In a person of this general type that does not leave any loophole at all. That seemed to be perfectly obvious when I saw her. We did not see any way of making a diagnosis between mesenteric thrombosis or embolus and perforation with peritonitis. The background of heart disease and arteriosclerosis made the other the first choice. I do not know—perhaps Dr. Richardson can tell—whether any case has been operated upon successfully in this hospital. I heard Dr. Balch speak of one in which he and Dr. Porter took out about four feet of intestine with success. The one or two cases I have done have not been successful. Medically I do not know that the mortality is any better. It is an interesting fact however that there have been reported one or two cases at autopsy with more or less complete occlusion of mesenteric vessels yet the patient not dying from that condition. Those are cases of slow onset, not this clinical type of sudden onset.

Dr. Smith: I have wondered whether people ever have minor mesenteric thrombosis and get over it. I remember one patient who had cerebral embolus, emboli in both lower extremities and then suddenly had an attack of intense abdominal pain. We decided she had mesenteric embolus with thrombosis. Then she proceeded to get over it. The diagnosis of course was up in the air. I do not think she had gall bladder disease. She had had three emboli already.

Dr. Edward P. Richardson: I know that the mortality is very high in mesenteric embolism and thrombosis. One case recovered after extensive resection between 1908 and 1918. I cannot say since then. But at any rate, with any extensive lesion the only chance is resection of the affected intestine. I should say it is possible to have embolism to such a limited extent that it might not permanently interfere with the circulation of the bowel. One of the striking things in these cases is the leukocyte count, which is often higher than is present in infection. Another source of difficulty is that interference with bowel circulation is sometimes due to embolism and sometimes to thrombosis. In embolism there is ordinarily quite clear-cut demonstrable pain. In thrombosis there is often a very indefinite history, and the condition may be found at autopsy when quite unsuspected.

CASE 16382

WHEN AN EXPLORATORY LAPAROTOMY IS JUSTIFIED

Surgical Department

An American janitor sixty-four years old entered May 27 for surgical observation. The chief complaints were vomiting, constipation and diarrhea of two months' duration.

He had always been well and strong until the past winter, when he had occasional days of feeling a sensation of weakness in the epigastrium relieved by a day's rest. March 25, two months before admission, he had a severe attack of sharp shooting pain in the epigastrium going through nearly to the back without radiation. This was followed in two hours by vomiting. During the next forty-eight hours he had several similar attacks, some of them severe enough to double him up. He was in bed under opiates for several days. Frequently the pain was accompanied or followed by nausea and vomiting not associated with meals. Two or three times during the second day he noticed that the vomitus was dark colored. His physician said that once it contained some blood. He stayed in bed for four days. The attack of pain lasted for only two days. After the attacks he was left with some tenderness just below the umbilicus. He continued to feel weak and to vomit every two to four days. For the past two weeks he had had occasional nausea but no vomiting. With the onset of the illness he developed constipation followed by periods of diarrhea generally brought on by taking a laxative. During the night before admission he developed watery diarrhea, although he had not taken a laxative for four days. Most of his pains recently had been just below the umbilicus. There had seldom been a day since the onset when he had not had at least one momentary attack of pain. He thought he had lost about twenty pounds during the illness.

The patient's physician sent the following report of examination by a well-known roentgenologist May 9, eighteen days before admission. "Examination made of the gastro-intestinal tract shows no abnormality in the stomach or duodenum. We do note marked stasis in the small intestine with severe dilatation of the loops of the ileum. It is a little difficult to recognize the point of obstruction, but it seems to be in the left lower quadrant. We may be dealing with adhesions, but on the other hand one cannot rule out the possibility of new growth. On account of the severity of the condition the obstruction would seem to be a surgical one."

The family history is not significant except that his wife's only pregnancy had ended in a stillbirth.

Forty years ago following an attack of measles he had a nervous breakdown lasting six months. He had "slow fever" for one summer thirty-

five years ago, a little kidney trouble twenty-five years ago with no later symptoms. All his teeth were pulled five months before admission. For a time after the extraction he felt better, in fact very well. Thirty-five years ago he weighed 169 pounds, his best weight, a year ago 154; present weight 134.

Clinical examination showed a somewhat thin, slightly pale elderly man in no apparent distress. Thyroid palpable on both sides. Chest slightly barrel shaped. Heart sounds distinct. Left border of dullness 9 centimeters to the left of midsternum, one-half centimeter outside midclavicular line. Right border of dullness at the sternum. Supracardiac dullness 5 centimeters. Artery walls palpable and tortuous. Blood pressure 130/90. Lungs normal. Abdomen flatly tympanitic. No definite masses were made out. It seemed however as if the intestines were palpable just to the left of and below the umbilicus. The right testicle was somewhat larger than the left. There was a definite lump the size of a marble just above the right testicle, possibly enlarged epididymis.

Before operation one of two urine examinations showed leukocytes and many red cells. The urine was otherwise negative. The blood is not recorded. Two stool examinations were normal except for positive bile tests. A Hinton test was negative.

X-ray examination with a barium enema showed no demonstrable organic lesion. Examination with a barium meal showed the stomach rather high in position, freely movable. Peristalsis passed normally to the pylorus. The duodenum showed no irregularity. There was a small residue. At six hours none of the barium had reached the cecum. The small bowel appeared somewhat dilated and contained gas. There was a loop of ileum which showed considerable dilatation and there appeared to be a point of obstruction in the right lower quadrant. At nine hours there was still no barium in the cecum. At thirty-six hours the small bowel was empty. There was considerable barium in the cecum and ascending colon and a small amount in the rectum, the intervening colon being empty. "The appearance is that of partial obstruction of the small bowel." May 12 further films made thirty-six hours after the barium still showed an appreciable amount of residue in the terminal loops of the small intestine. The colon was filled uniformly with the barium meal. "There is no evidence to suggest any localized pathology in the large intestine."

The patient was comfortable in the ward. Gastric analysis was done May 30. Fasting contents of the stomach: 20 cubic centimeters of yellowish cloudy material with white particles, no free hydrochloric acid, total acid 6. A test meal at one hour gave 34 cubic centimeters of similar material, no free hydrochloric acid, total acidity 11. Both specimens showed positive tests for lactic acid, negative for guaiac.

June 6 operation was done.

Discussion

BY EDWARD L. YOUNG, JR., M.D.

In the majority of cases which we see today with abdominal symptoms as marked as this man showed it is possible to make a diagnosis sufficiently accurate to guide one in operation. Here is a case, however, in which the symptoms were rather indefinite and all examinations almost negative or even misleading. The x-rays were not conclusive. While in the ward the patient was apparently perfectly normal,—ate well, had good bowel movements and had no pain. It is impossible to put the diagnosis as any of the well known conditions.

The question came up whether an operation was justified. A review of the case seemed to clinch the fact that there had been too much trouble to disregard. The man was in the cancer age. However accurate the x-rays, they are not infallible. It seemed as though exploration on the basis of possible malignant obstruction was amply justified. This was done.

PRE-OPERATIVE DIAGNOSIS

Partial intestinal obstruction.

OPERATION

Ether and spinal novocain anesthesia. Right paramedian incision at the level of the umbilicus. The peritoneal cavity was opened. The terminal ileum was thickened and reddened. It was explored and the mesentery of the ileum examined, but no obstruction could be found. Further exploration showed multiple scars in the mesentery. About midway along the transverse colon, the small bowel, apparently midjejunum, was adherent to the transverse colon, and was itself contracted so as to cause obstruction. It was impossible to say whether this was a tumor of the small bowel or contraction of an old inflammatory ulcerative process. It was freed from the transverse colon and an aseptic resection of six inches of upper ileum was done with an end-to-end anastomosis. White scarring was noted in the neighboring mesentery.

PATHOLOGIC REPORT

The specimen consists of a segment of small intestine 13 centimeters in length. There is a very definite sharply localized constriction near the center of the specimen. The bowel on one side of this constriction is markedly dilated, measuring 4 centimeters in diameter, while on the other side the bowel is normal in size and measures 1.5 centimeters in diameter. The wall, particularly in the dilated portion, is considerably thickened. Section shows a marked hypertrophy of the muscularis both at the site

of obstruction and proximal to it. The mucosal surface for a distance of about two centimeters on each side of the constriction is injected and covered over about half its extent by a soft yellowish "diphtheritic" film. Otherwise the mucosa is negative. There is no gross evidence of tumor.

Microscopic examination shows a moderate diffuse inflammatory infiltration involving the entire wall but most marked in the mucosa and characterized by a predominance of eosinophiles. The muscularis mucosa and the two layers of the muscularis are separated by edematous vascular young granulation tissue showing a slight inflammatory infiltration. There is no evidence of any specific lesion or of malignancy.

A section through the constricted region shows a small area of complete disruption of both the circular and longitudinal muscle layers and replacement by a vascular granulation tissue showing a marked chronic inflammatory infiltration with eosinophiles predominating as elsewhere. The mucosa is missing, being replaced by superficially necrotic granulation tissue showing a marked acute and chronic inflammatory infiltration. Nothing further indicative of the etiology is seen.

Further Discussion

To our surprise the condition described was found. It seemed as though he should have had even more trouble than he had, the obstruction was so complete.

FURTHER HISTORY

The patient made an unusually good convalescence and was discharged June 19 on a six meal bland diet*.

September 1 his physician reported that the patient continued to do well and had had no recurrence.

*Six meal bland diet.

Breakfast. Cooked cereal with sugar and cream (2 ounces 20 per cent cream). One soft cooked or dropped egg. One slice buttered toast. One glass of milk.

10.30 a.m. Six ounces of milk, cocoa, malted milk or eggnog. Two crackers.

Dinner. Chicken broth. Scraped beef, fricassee of chicken, minced chicken with fricassee sauce. Baked or mashed potato. One slice of bread with butter. Custard or plain ice cream. One glass of milk.

3.00 to 4.00 p.m. Six ounces of milk. Two crackers.

Supper. Cream soup, six ounces, different varieties. Rice, macaroni, etc. One slice buttered toast or milk toast. Apple sauce, prune whip, or simple pudding.

9.00 p.m. Six ounces of milk, cocoa or malted milk.

He reported July 1. He was eating well, looking and feeling very well. The scar was firm.

DIAGNOSIS

Subacute intestinal obstruction caused by healed jejunal ulcer.

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THE OPERATION OF RAMISECTION

THE surgery of the sympathetic nervous system has developed to a point where certain conclusions can be drawn from the work done since 1923, when Dr. N. D. Royle, of Australia, suggested ramisection as a form of treatment for patients with spastic paralysis. The reports were, at first, enthusiastically received by physicians throughout the world and great interest was shown in the whole subject. At the present time Dr. Royle reports, in his recent paper read at the British Medical Association meeting held at Winnipeg, Canada, August, 1930, that he has now performed the operation over six hundred times, on approximately three hundred different patients. The operative mortality has been less than 1 per cent. and, of the cases of spastic paralysis treated in this manner by the originator of the operation, 70 per cent. have been distinctly benefited. His conclusions, and those of other observers, are abstracted in the discussion following Dr. Fulton's paper on the same subject in this issue of the *New England Journal of Medicine.*

Dr. Royle's opinion, however, is not borne out by that of other investigators. Recently, in *The Lancet,* July 19, 1930, a group of physicians in London reëxamined six patients operated upon by Dr. Royle in 1927. There was a temporary diminution of tone observed in both upper and lower limbs, with some improvement of voluntary power, in all of the patients. The diminution of tone and improvement of function were, however, short lived and within a few weeks or months the spasticity returned to the condition found before the operation. The ten physicians reached the general conclusion that the operation had no place of value in the treatment of spastic paralysis, a conclusion quite different from that reached by Dr. Royle himself.

In the discussion at Winnipeg one or two other physicians upheld Dr. Royle's point of view, but the general trend seems to have been that ramisection was of very slight value in cases of spastic paralysis due to disease of the pyramidal tracts and even of less value in the muscular rigidity seen in the Parkinsonian state. These conclusions bear out what the physiologists had already suggested in relation to the function of the sympathetic nervous system and its control of muscular tone. From the beginning of the experimental and clinical work, no physiologist of note felt that there was any justification for ramisection in cases of spastic paralysis.

On the other hand, there have come from this work a number of surprising developments and certain diseases have yielded to operations on the sympathetic system that had previously been resistant to any other form of treatment. The rare condition known as Hirschsprung's disease, a dilatation of the large bowel, has responded to ramisection in practically all cases, with excellent results. An even rarer disease, far distant in the body from the location of Hirschsprung's syndrome, retinitis pigmentosa, has also responded well to sympathectomy and, in one case reported by Dr. Royle, vision was recovered up to 20/30 in a patient whose visual acuity previously had been reduced to shadow perception. In Raynaud's and Buerger's disease the results have been fairly good, better in Raynaud's than in the latter condition. The operations, too, have been used in relation to the heart and great vessels, especially for the relief of angina pectoris, with some good results.

The whole subject is fully discussed by Dr. Fulton and the other speakers at the symposium held in Winnipeg. Little can be added to what was said at that meeting, but it should be emphasized that ramisection and other similar operations are long, difficult procedures and should only be done by surgeons well trained in neurological surgery. The decision, moreover, to do such an extensive operation should not be entered into casually. So far as we can judge at present, the operation is entirely justified in

Hirschsprung's and Raynaud's disease and in retinitis pigmentosa. In all other conditions it is of somewhat doubtful value.

THE FAMILY IN A CHANGING WORLD

THE changing responsibilities of parenthood form the thesis of a recent release by the White House Conference on Child Health and Protection. Old problems are being dealt with, but in a totally new setting, for, according to Sidonie M. Gruenberg, the home itself, which in the past was the economic and social center of family living, is, in many cases, coming to be an emotional center only.

Contacts of parents with their children are becoming briefer, for with the increasing complexities of life not only are parents more occupied, but the life of the child is more organized and complicated. Large families are becoming less common and the closely-knit groups of children and adults within the radius of the family circle are largely things of the past.

We hear frequently deplored the loss of home life in America. To a considerable extent this is true, for the demands made upon us by a rapidly progressing society are many, to say nothing of the multiple distractions offered by rapid transportation and easily available amusements. This is the environment to which our children are exposed; it is the atmosphere in which many of their parents have been reared or to which they have accustomed themselves.

The old methods of dealing with children, whether right or wrong, have gone by the board. There are lacking the former opportunities for parental and filial intimacy; old standards of discipline have become discarded, and perhaps rightly so. Children are allowed more opportunity of exercising their initiative; parents have discarded the "stuffed shirt" attitude of a generation or two ago.

With all this change in viewpoint; this decided shift in environment, parents have been attacked for their incompetence. They have tried to hold to the old ways, of which perhaps they knew little, but they were all they had to hold to. One after another their original prerogatives, as the world has changed, have been taken from them, but little constructive guidance has been substituted. They still remain, however, the natural guardians of their children; the bulwarks which protect them from the world. They cannot be neglected as the most potent factor in child guidance.

Instead of substituting for parental guidance new formulas, the parent and the home must be recognized as the only constant and continuous agencies that care for children. We cannot dispense with them, consequently we must adapt them to existing conditions. This the White House Conference is seeking to do—to educate the parents to their job; to interpret and classify the growing body of knowledge which is already available.

AN ATTACK ON THE MASSACHUSETTS STATE DEPARTMENT OF PUBLIC HEALTH

NEWSPAPERS report that Dr. Patrick J. Foley, a dentist, and a candidate for the nomination for the Governor's Council, is issuing attacks on the Massachusetts State Department of Public Health for alleged failure to provide enough cancer and tuberculosis clinics.

He is quoted as charging that "the State was sacrificing its poor on the altar of gross negligence".

This would be important if true but Dr. Foley should compare the situation in Massachusetts with that in other states. He may be interested to learn that Massachusetts is regarded as a pioneer in dealing with tuberculosis and cancer and that the testimony of many competent observers tends to show that this Commonwealth is in the vanguard of the states of this country in efficient management of the resources of medicine in dealing with tuberculosis and cancer.

With all due regard to the great services rendered by previous administrations of public health in Massachusetts it seems fair to say that the present structure of public health administration is on a firmer foundation and reaches to greater heights than ever before in our history.

That certain defects and opportunities for betterment are as fully realized by our Commissioner and his associates as by anybody is our belief; greater progress will be made when the public and the medical profession may furnish more effective coöperation we also believe.

It may be good political material to allege that the poor are being neglected but may it not be an evidence of an unsound and emotional appeal.

We are not presenting these views with any desire to enter into a political discussion but feel that a candidate should be reasonably conservative in dealing with public health matters and officials.

A study of the staggering expenditures of this State in dealing with its dependents is impressive. Aside from the financial problems we believe the results are equally significant.

GOVERNOR ALLEN IS REPORTED AS HAVING CALLED ATTENTION TO UNSCRUPULOUS DOCTORS

THE *Boston Herald* is authority for the statement that in a letter to the Insurance Commissioner of Massachusetts Governor Allen alleges that the high rates in automobile insurance are caused chiefly by "fake and inflated claims brought by unscrupulous lawyers and doctors".

If the Chief Executive of the Commonwealth feels warranted in making this statement there must be facts to support it.

The question as to why the behavior of fake

doctors has not been reported to the Board of Registration in Medicine is pertinent.

With the resources of the State at the Governor's command we respectfully suggest that the black sheep in the medical flock be adequately dealt with.

THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

LIGHT, RICHARD U. Ph.B., M.D. University of Michigan 1928. Surgical House Officer, Peter Bent Brigham Hospital 1929-1930. Address: 721 Huntington Avenue, Boston. Associated with him is:

SOSMAN, MERRILL C. A.B., M.D. Johns Hopkins University School of Medicine 1917. Roentgenologist to the Peter Bent Brigham Hospital. Assistant Professor of Roentgenology, Harvard Medical School. Address: 721 Huntington Avenue, Boston. Their subject is: "The Treatment of Carbuncles by the Roentgen-Ray." Page 549.

FULTON, JOHN F. S.B., B.A., M.A., Ph.D., M.D. Harvard 1927. Junior Associate in Neurological Surgery, Peter Bent Brigham Hospital 1928. Fellow of Magdalen College, Oxford 1928-1930. Sterling Professor of Physiology, Yale University School of Medicine 1930. His subject is: "The Physiological Basis of the Surgery of the Sympathetic Nervous System." Page 555. Address: Dept. of Physiology, Yale University School of Medicine, New Haven, Conn.

HATT, R. NELSON. B.S., M.D. Tufts College Medical School 1918. F.A.C.S. Chief Surgeon at Shriners' Hospital for Crippled Children, Springfield, Mass. Orthopedic Surgeon at Wesson Memorial Hospital, Springfield. Consulting Orthopedic Surgeon at Springfield Hospital and Noble Hospital in Westfield. Address: 146 Chestnut Street, Springfield, Mass. Associated with him is:

HOUGH, GARRY DEN., JR. B.S., M.D. Harvard 1921. F.A.C.S. Assistant Surgeon, Shriners' Hospital, Springfield. Assistant Orthopedic Surgeon at Wesson Memorial Hospital, Springfield. Address: 146 Chestnut Street, Springfield, Mass. Their subject is: "An Analysis of the Cases of Infantile Paralysis Treated at the Shriners' Hospital for Crippled Children, Springfield, Mass., During 1925." Page 561.

BLAND, EDWARD F. B.S., M.D. University of Virginia 1927. Dalton Fellow, Cardiac Clinics and Laboratory, Massachusetts General Hospital, Boston. Address: Massachusetts General Hospital, Boston. Associated with him is:

SPRAGUE, HOWARD B. A.B., M.D. Harvard 1922. Assistant Physician, Massachusetts General Hospital Cardiac Clinics and Laboratory. Visiting Physician, House of the Good Samaritan, Boston. Address: 270 Commonwealth Avenue, Boston. Their subject is: "Progress in the Study of Cardiovascular Disease in 1929." Page 574.

THE BOSTON MEDICAL LIBRARY

THE HISTORY OF ANATOMY AND ITS INFLUENCE UPON THE SCIENCE AND ART OF MEDICINE*

(*Continued from Page 546, Issue of Sept. 11*)

It was not until early in the 16th century that anatomical text books were illustrated and the first of these was that of Jacob Berengar of Carpi who was Professor of Surgery at Bologna from 1502-1527. To modern surgeons it is interesting to note in passing that he was the first to describe and figure the appendix. To this period belongs that type of anatomic illustration known as the "fugitive anatomical sheets", which were intended alike for students both of medicine and art and are generally of figures giving the merest outline sketch of anatomy. Charles Estienne, the physician, member of the celebrated family of book publishers of that name, printed an illustrated anatomy and was the first to figure the entrance of blood vessels into bone and to comment on the presence of valves in the veins. The one hundred years after 1450 was notable chiefly for the work of a group of Humanists, many of whom were physicians and to whom is owed the recovery of practically all the medical classics which we possess, most of them translated into good Latin versions. Conspicuous among these are the names of Günther and Sylvius, the latter the first (1531) distinguished anatomist of the Paris faculty and the teacher of Vesalius. Singer, in accounting for the advent of Vesalius (1514-1564), says that Vesalius' "intellectual father was the Galenic science and his mother the new Art. Until these two had come together there could be no Vesalius. When these two had come together there had to be a Vesalius." The chief distinction between the point of view of Vesalius, who was a humanist, and the point of view of modern evolutionary anatomists Singer puts succinctly in the following way, "We think of Anatomy in terms of evolution and our question always is 'whence' and 'how?' Vesalius thought of Anatomy in terms of Design, and his questions would have been 'whither' and 'Why?' "

Succeeding Vesalius came Eustachius, Servetus (the latter being rather a contemporary, both being pupils of Günther), Fallopius, Columbus, Coiter, Fabricius, who taught Harvey and published a work "On the Valves of the Veins", and Spigelius. Certain of the pupils of the Paduan School returned to their native countries, notably to Holland, France and England. In Holland the greatest activity was at Leyden, where Peter Paauw, a pupil of Fabricius, settled. A pupil of his, Tulpius (1593-1674) figures in Rembrandt's famous anatomical

*Contributed by Charles F. Painter, M.D., Librarian.

painting, now hanging in one of the galleries of The Hague. In Germany advances in the study of anatomy were more tardy in making their appearance, largely because the art of the Renaissance and humanistic learning arrived at a later period but when they did come the trend of events in the progress of anatomical study was similar to that in northern Italy. Linacre was the first to bring back to England humanistic ideas. This was in 1518 when he founded the Royal College of Physicians. In this manner after the establishment of the College of Surgeons in England in 1540, Dr. Caius on his return from Padua in 1544, where he began a twenty-year period of anatomical teaching succeeded in persuading King Henry VIII to grant the College the right to dissect four felons per year. Queen Elizabeth extended this privilege, in 1564, to the College of Physicians. In 1581-83 the College of Physicians created lectureships and built, in Knight Rider street, the first anatomical theatre in Great Britain. To prevent too free a use of the privilege of dissecting, a fine of ten pounds was imposed upon anyone, not a "Barber-surgeon", who dissected the human body. Gradually however all the distinguished anatomists and surgeons in London had their own dissecting rooms and with the advent of the Hunters, Museums were developed around these where teaching was carried on. Most significant of all the English bearers of Paduan tradition was William Harvey, who was at Padua from 1597-1602. When he returned he began his lectures before the Royal College of Physicians in 1615.

With the establishment of the Universities of Northern Italy, as we have seen, anatomical study came into its own. The most famous school of them all, Bologna, was founded in 1119 but it was not until 1315, as above related, two hundred years before Vesalius' day, that Mondinus did the first human dissection in Europe. To this school, and that of Salernum, must be credited the perpetuation of such scientific interest in anatomy and medicine as was beginning to dawn on Europe in the middle ages. Of those individuals who contributed to this and were connected with the University at Bologna, may be mentioned Carpi, Vesalius, Arantius, Malphigi, Valsalva, Varolius and Galvani. During the 16th century these Universities had thousands of students, many of whom came there from countries then quite remote but they carried back with them the thirst for anatomical knowledge which they had acquired and thus fostered an interest in dissection in their home countries.

Cheselden (1688-1752), perhaps expresses the true surgeon's viewpoint upon the value of anatomy to his art. He was known for his surgical skill but thought of himself, and liked others to think of him, as an anatomist who was disposed to belittle the attention paid to anatomical minutiae and to quote him is to indicate the reason why he was a great surgeon, and why, in his hands, anatomy could be so interestingly taught. He says, "The study of Anatomy as it leads to a knowledge of Nature and the art of healing needs not many tedious descriptions nor minute dissections; what is most worth knowing is soonest learned and least the subject of dispute; while describing and dividing the parts, more than the knowledge of their uses requires, perplexes the learner and makes the Science dry and difficult. . . . I have pretty much neglected the minutiae of Anatomy, nor have I been very particular about those things which cannot be understood without being seen, and having been seen need little description, but have endeavored to be more explicit about those things which are of greatest use in Philosophy, Physic and Surgery. I could wish the dividing and distinguishing of parts could be more usually done with more regard to these valuable ends."

It was not until early in the 18th century that dissection had become common enough for anyone to perfect a special forceps for this purpose. It will be shown that in Rembrandt's famous painting in The Hague, which is so common a wall decoration in physician's offices, that Tulpius has a pair of *surgical* dressing forceps in his hand which places this picture considerably back of the 18th century, in fact two hundred years prior to that time.

It is interesting to note that as far back in American medical history as 1647 Eliot, the apostle to the Indians, complained of the lack of education in anatomy particularly among the physicians of the day and urged that opportunity for dissection be in some way procured for those who were anxious to train for the practice of medicine. Some knowledge on this subject was undoubtedly obtained from post mortem examinations just as was done by Mondinus in the 14th century, for Packard records a series of 176 autopsies performed in New England from 1674-78. In 1730 Cadwalader returned from Europe where he had been studying under Cheselden and gave demonstrations in Anatomy in Philadelphia where he persuaded the Senior Dr. Shippen to send his son abroad to study in 1758. He ultimately returned to Philadelphia where he became the first Professor of Anatomy in a Colonial medical school, the first one established in this country. It was not much later that formal instruction in Anatomy was given in New York, Baltimore and Boston. Dr. Thomas Bard had, in 1750, injected and dissected an executed criminal in New York. In 1713 a Theatrum Anatomicum was founded in Berlin and the Vienna Theatre was established in 1718 though it was not until 1741 that they were able to secure much material for dissection. Saltzman, at Strasburg in 1708, had daily dissections and gave three weekly demonstrations. Haller at Tubingen was able to use only a few days for his demonstra-

tions on account of lack of material and was nearly mobbed in Paris because of a body snatching episode. Prague was even less fortunate for there were only three dissections there between 1692 and 1712. Chairs in anatomy were established at the British Universities at Edinboro in 1705, Cambridge in 1707, Glasgow 1718, Oxford in 1750 and Dublin in 1785. [When Shippen, Jr., returned from his foreign study in 1762 he brought with him a number of models donated to the University of Pennsylvania by Dr. Fothergill, an English Quaker, who was interested in the founding of the University of Pennsylvania.] In 1780 Dr. John Warren began a course of lectures on anatomy with dissections before an Institute in Cambridge which was the forerunner of the Harvard Medical School.

(To Be Continued)

MISCELLANY

CANCER IN AMERICAN CITIES

Hoffman's article in "The Spectator" is quoted in the *Bulletin of the City of New York Department of Health* in which it is shown that the cancer death rate of forty-nine American cities with an aggregate population of about thirty million increased from 71.6 per 100,000 in 1906 to 117.8 in 1929. It was pointed out that the rates in most European countries are higher than those in the United States. This increase in this country suggests that the great increase may, as has often been suspected, be due in some measure to more accurate diagnosis in the later years of this period.

"MEDICAL FEE SPLITTING"

To the Editor of The Herald:

Your editorial recently on "Medical Fee Splitting" must be disturbing to the general physician, the specialist and the public.

The experience of one who has been in general practice over 29 years within 10 miles of Boston may probably throw a bit of light on actual conditions hereabout.

During this period of time which is probably at least the practice span of the average physician, no surgeon or other specialist has split or has intimated his willingness or desire to split his fee with me.

The only exception I can recall to the above statement was one ambiguous suggestion made some 20 years ago.

Having been at least "average busy" I have necessarily called upon the services of many specialists, the large majority perhaps of my own choosing, but many, many others of wholly impartial selection.

As this question of fee splitting in our profession has now been raised, it is a source of great satisfaction to me that I am able to give this testimony so creditable to the medical profession, and I cannot but believe that my own experience has also been that of the great bulk of the profession around Boston.

Thanking you for the space.

RICHARD DUTTON, M.D.

Wakefield, September 6.

—*Boston Herald.*

INFANT MORTALITY DECREASING

The downward trend of infant mortality in the cities of the United States during 1929 continues, according to a report just issued by the American Child Health Association in which the figure of 66.2 deaths among each thousand births is announced.

Next to the rate of 64.9 attained in 1927, the rate for 1929 is the lowest ever recorded for the cities of the country. It was the lowest ever attained in Chicago, Philadelphia, Detroit, Boston and Baltimore and Pittsburgh exhibits the most outstanding decline, the rate dropping from 120 to 77 in the period 1925-1929.

Portland, Oregon, had the lowest rate among the cities over 250,000 population. Seattle was a close second with 46 and Minneapolis stood third with 49. Among the 10 largest cities in the country, St. Louis and New York tied for first place with rate of 59. Close on their heels came the metropolis of the middle west, Chicago, with a rate of 60. Other figures were Cleveland 61, Philadelphia 62, Los Angeles 65, Detroit and Boston 69, Baltimore and Pittsburgh 73.

As a group, the cities of the Pacific Coast continue their undisputetd leadership as the banner home for babies. Oregon and Washington lead the procession with Minnesota in third place.—*Bulletin National Tuberculosis Association.*

BUREAU OF THE CENSUS

RHODE ISLAND MORTALITY STATISTICS: 1929

Washington, D. C., September 1, 1930.—The Department of Commerce announces that there were 8,916 deaths in Rhode Island in 1929 as compared with 8,394 in 1928.

No death rates for 1929 have been computed because any rates based on population estimates made at this time would be unreliable and would have to be materially revised as soon as the 1930 census figures become available.

Increases in deaths in 1929 over those of the preceding year were from the following principal causes: Diseases of the heart (1,665 to 1,775), cancer (846 to 925), and cerebral hemorrhage and softening (745 to 755). There were more than twice as many deaths from influenza as in the preceding year (102 to 318), and other increases were from pneumonia, all forms (705 to 891), congenital malformations and diseases of early infancy (457 to 501), appendicitis and typhlitis (93 to 110), bronchitis (49 to 64), and puerperal causes (78 to 97). There were 2 deaths from malaria in 1929, and deaths from suicide increased from 67 to 76.

Significant among the decreases in deaths in 1929 were those from the following principal causes: Nephritis (803 to 735), and tuberculosis, all forms

(492 to 472). Decreases were also shown in diarrhea and enteritis, under 2 years (91 to 56), and measles (70 to 49).

Deaths from all accidental causes decreased from 484 to 440, the types of accident showing the greatest decreases being accidental falls (110 to 95), burns, conflagration excepted (39 to 30), accidental drowning (50 to 41), automobile accidents, excluding collisions with railroad trains and street cars (154 to 146), and railroad accidents (12 to 7).

LIST OF PHYSICIANS REGISTERED BY MASSACHUSETTS BOARD OF REGISTRATION IN MEDICINE, MARCH, 1930

Adler, Bernard, 130 Brainerd Road, Allston, Mass.
Amarantes, Albert Roland, 64 Rotch Street, New Bedford, Mass.
Asbury, Edwin Vansurlay, 144 Worcester Street, Boston, Mass.
Brose, Paul Mitchell, 39 East 36th Street, Bayonne, New Jersey.
Burckel, Arthur Walter, Worcester State Hospital, Worcester, Mass.
Burckes, Anna Woodworth, 31 Clark Lane, Waltham, Mass.
Camoezas, Joao Jose deConceicao, 1248 Rockville Avenue, New Bedford, Mass.
Campbell, Jessie Deans, 58 Lakeview Avenue, Cambridge, Mass.
Cleary, Harold John, St. Mary's Hospital, Waterbury, Conn.
Cooke, Albert Alden, 188 Highland Avenue, Detroit, Michigan.
Crossfield, Kendall Bates, Worcester State Hospital, Worcester, Mass.
Diez, Mary Luise, 37 River Street, Boston, Mass.
Eagan, William Thomas, St. Joseph's Hospital, East 143d Street, New York City, N. Y.
Egloff, William Chauncey, 205 Dudley Road, Newton Centre, Mass.
Freedberg, Harry, 22 Willow Avenue, Salem, Mass.
Freitag, Abraham, 2071 -76th Street, Brooklyn, New York.
Gittleman, Irving, 43 Fabyan Street, Boston, Mass.
Gleason, Ralph Sidney, Eastern Maine General Hospital, Bangor, Maine.
Grapek, Erma Myers, 1225 Great Plain Avenue, Needham, Mass.
Hardcastle, Charles Reginald, 805 Washington Street, Boston, Mass.
Hiden, Robert Battaile, Box E, Stockbridge, Mass.
Hilton, Philip Frederick, Bridgeport Hospital, Bridgeport, Conn.
Ingraham, Franc Douglas, 40 St. Paul Street, Brookline, Mass.
Kammsky, Jacob, Rutland State Sanatorium, Rutland, Mass.
Katwick, Arthur David, 193 Arsenal Street, Watertown, Mass.
Kennedy, Joseph Louis, Carney Hospital, South Boston, Mass.
Leavitt, Benjamin, U. S. Marine Hospital, Ellis Island, N. Y.
LeBrecht, William George, 6 Stedman Street, Brookline, Mass.
Levine, Julius, Memorial Hospital, Philadelphia, Pa.
Lutkiewicz, Joseph, Maryland T. B. Sanatorium, Henryton, Carroll Co., Md. (Colored Branch)
Macdonald, Donald Hector, Mass. Eye and Ear Infirmary, Boston, Mass.
MacMillan, Willard, 10 Lancaster Street, Cambridge, Mass.
Manley, Victor John, Guildford Street, Brattleboro, Vermont.
Marnell, Thomas Frank, Eagleville Sanatorium, Eagleville, Pa.
Matern, Herman Ludwig, 14 Duxbury Road, Worcester, Mass.
Moore, Thomas James, 157 Dana Avenue, Hyde Park, Mass.
Morrill, Herman Alfred, 19 Pleasant Street, Gardner, Mass.
Nadeau, Gabriel, Rutland State Sanatorium, Rutland, Mass.
Norton, Matthew Vincent, Carney Hospital, South Boston, Mass.
Noyer, Harry Franklin, 36 Larch Street, New Bedford, Mass.
Offenhauer, Veda Eloise, 173 Nesmith Street, Lowell, Mass.
Pope, Alton Stackpole, 92 Central Avenue, Newtonville, Mass.
Putnam, Lawrence Arthur, 34 Worcester Square, Boston, Mass.
Rouillard, Francis, Boston Lying-In Hospital, Boston, Massachusetts.
Smith, James Wallace Hepburn, 174 State Street, Springfield, Mass.
Thomas, John Donoclift, 483 Beacon Street, Boston, Mass.
Thompson, William Ransom, 415 Wyman's Exchange, Lowell, Mass.
Vaill, Anna Wadhams, c/o Dr. Sartwell, 687 Boylston Street, Boston, Mass.
Zollo, Felice John, 351 Revere Street, Revere, Mass

Registered December 20, 1929

Coleman, William Levin, Smithtown, N. H.

List of Physicians Registered by Massachusetts Board of Registration in Medicine by Virtue of National Board Registration. (Registered Since November, 1929.)

Abramson, Daniel, Boston Lying-In Hospital, Boston, Mass.
Anderson, Gaylord West, 137 Englewood Avenue, Brookline, Mass.
Baty, James Marvin, Children's Hospital, Boston, Mass.
Brailey, Allen Gilbert, 205 Beacon Street, Boston, Mass.
Bloomberg, Wilfred, 54 Babcock Street, Brookline, Mass.
Brown, Madelaine Ray, Boston City Hospital, Boston, Mass.
Davis, William Edwin, 125 Peterborough Street, S. 4, Boston, Mass.

d'Elseaux, Frank Christian, Boston Psychopathic Hospital, Boston, Mass.
Dixson, Ira Milburn, Mass. General Hospital, Boston, Mass.
Fitz Hugh, Greene, 384 Riverway, Boston, Mass.
Glover, Eugene Chellis, 486 Brookline Avenue, Boston, Mass.
Hyde, Robert Dwight, 26 Maple Street, Springfield, Mass.
Johnson, Allen Sheppard, 55 Chestnut Street, Springfield, Mass.
Joplin, Robert Jefferson, 1 Acorn Street, Boston, Mass.
Jordan, William Riely, 93 Binney Street, Brookline, Mass.
Leech, John Verner, Boston Lying-In Hospital, Boston, Mass.
Lerman, Jacob, 37 Almont Street, Dorchester, Mass.
McKee, Frederick William Haskell, 210 Bay State Road, Boston, Mass.
Moses, Sanford Hiram, Jr., 21 Shaler Lane, Cambridge, Mass.
Nowak, Stanley John Gregory, Boston Lying-In Hospital, Boston, Mass.
Palermo, Alfonso Albert, Pondville Hospital, Wrentham, Mass.
Rhees, Morgan John, Mass. General Hospital, Boston, Mass.
Rich, Gilbert Joseph, 51 Summit Avenue, Brookline, Mass.
Saul, Leon Joseph, Boston Psychopathic Hospital, Boston, Mass.
Sears, John Berell, 330 Brookline Avenue, Boston, Mass.
Segal, Samuel, Lakeville State Sanatorium, Middleboro, Mass.
Sherwood, David Winne, 210 Riverway, Boston, Mass.
Strieder, John William, 14 Jason Court, Arlington, Mass.
Taussig, Helen Brooke, 2 Scott Street, Cambridge, Mass.
Teagarden, Elmer Jay, Jr., Strong Memorial Hospital, Rochester, New York.
Tyndall, Marian, Camp Bonnie Dune, So. Dennis, Mass.
Wallace, Richard Hendrickson, Mass. General Hospital, Boston, Mass.

Massachusetts Board of Registration in Medicine

Report of the March, 1930, Examination

School	No. Registered	No. Rejected
Middlesex College of Medicine and Surgery	6	11
Kansas City University of Physicians and Surgeons	1	4
Mass. College of Osteopathy	5	3
Tufts College Medical School	9	
College of Physicians and Surgeons, Boston	2	1
Missouri College of Medicine and Science	2	2
Philadelphia College of Osteopathy	2	2
University of Lisbon	1	
University of Virginia	1	
University of Nebraska	1	
Boston University School of Medicine	4	
Kirksville College of Osteopathy and Surgery	3	1
University of Glasgow	1	
University of Vermont	2	
University of Montreal	1	3
Harvard Medical School	2	
Hahnemann Medical College, Philadelphia	1	
Rush Medical School	1	
McGill	1	
Johns Hopkins	1	
Woman's Medical College of Pennsylvania	1	
American School of Osteopathy	1	
St. Louis College of Physicians and Surgeons		1
Totals	49	28

National Board Diplomates

Harvard Medical School	26
Johns Hopkins	3
University of Chicago	1
University of Virginia	1
College of Physicians and Surgeons of Columbia	1

EXCERPT FROM A LETTER TO DR. L. VERNON BRIGGS FROM PROFESSOR GEORGE ROBERTSON

Tipperlinn House,
Morningside Place,
Edinburgh.
30th July, 1930.

Colonel L. Vernon Briggs,
Santander,
Spain.

Dear Dr. Briggs,

I am so glad to receive a letter from you, but sorry on account of the news it contains of Dr. Wallace's death. Of all the men I met in America the one who impressed me most on account of his humanity and his grasp of the principles of psychology in dealing not only with normal people but with subnormal, was Dr. Wallace. Nothing clinical that I have seen has impressed me more than the sight of groups of very defective children engaged in simple manual occupations, which would ultimately lead to useful labour. These children were engaged in digging sand and shifting stones and hammering nails into wood and taking them out again and such like occupations; but the feature of the work was that it was done with enthusiasm and enjoyment and much more like a play or game than a lesson; and all the while their character was being moulded and they were developing habits which would almost become instincts and lead them to be almost useful citizens. He had grasped the usefulness of the emotional element and he had made use of it.

Not only did this apply to the children but also to

their nurses and teachers. Nothing can be more disheartening and exhaust one's patience than the tuition of a backward child. The amount of labour and energy expended in teaching such a child seems to be a waste of time and energy when contrasted with the quickness of apprehension and skill of normal children. But Dr. Wallace kept these defectives in his institution and after years of patient work demonstrated to the Staff the excellent results obtained. I saw adult defectives working in the fields as if they were normal labourers. This magnificent result contrasted with the tragedy that would have happened, had this patient instruction not been continued for years, was continual inspiration and encouragement to his Staff. Dr. Wallace grasped all these things and applied them in a manner and with a success that I have never seen elsewhere done.

I am very glad you gave me an opportunity of meeting this great and wonderful man; and I was happy to know that his good work and his goodness of heart were appreciated by everyone.

I have written to several institutions in America to get photographs of any pictures they have of Dorothea Dix. She was painted 14 times and I saw a painting at Trenton and there is an excellent one in Nova Scotia. I have also seen the engraving in Tiffany's book which is an excellent one and another in the account given of the Institutions in the United States and Canada.

I would like very much if her friends and admirers in America could help us in getting this plaque, a copy of which I think should be sent to the Scottish Board of Control. My object is to have it unveiled ultimately by the American Ambassador. I am going to ask Professor Taylor to help me because women who are feminists are keen about doing honour to their own sex. I spoke to Lady Rhonda about Dorothea Dix and she was anxious for an article in "Time and Tide" on her life. She was a great woman to whom justice has not been done.

I am,

Yours sincerely,

GEORGE ROBERTSON.

RURAL HEALTH SERVICE

Studies and demonstrations have been conducted by the United States Public Health Service in rural sanitation since 1916. Notable progress has been made since that time.

For the period beginning January 1, 1930, 505 counties or districts were provided with local health service under full-time local (county or district) health officers. This shows a net gain of 38 over the preceding year. The largest gain in one State was that of 15 in Tennessee.

Over 76 per cent. of the rural population of the United States is as yet unprovided with official local health service which approaches adequacy. As a consequence of this deficiency, there is a sacrifice of the health and lives and material resources of many persons every year, a sacrifice which is needless because preventable, and preventable by measures readily within our means and demonstrated to be in the highest sense economical. The situation is practical and urgent. It should be dealt with cogently, constructively and promptly.—*United States Public Health Service.*

GOLD MEDAL AWARDED DOCTOR ROSCOE R. SPENCER FOR WORK ON ROCKY MOUNTAIN SPOTTED FEVER

Dr. R. R. Spencer, United States Public Health Service, was awarded the Gold Medal by the American Medical Association in annual session at Detroit in June, 1930, for original work in the preparation of a vaccine against Rocky Mountain spotted fever.

A five-year record of practical prevention of Rocky Mountain spotted fever achieved by Dr. Spencer was the basis for the award of the medal. Rocky Mountain spotted fever is a disease of the northwestern part of the United States, conveyed to man by the bites of wood ticks which appear with the first warm days of spring or as soon as the snow melts on the south slopes of the canyons. Skin eruption appears about the third day of fever, first on the wrists, ankles and back, and then over the whole surface of the body. In some localities the disease is mild while in others it is very fatal, causing death from the seventh to the tenth day of illness.

In one large locality the disease caused the death of 85% of adults who contracted it in the twelve years 1917-1928. In that locality the quest for a preventive inoculation has gone on at the hands of Dr. R. R. Spencer of the United States Public Health Service year after year until, in 1924, came the discovery the results of which were presented to the American Medical Association.

In a community of 1208 persons, 496 received the prophylactic inoculation and among these there were 3 mild cases which recovered. But among the 712 who did not receive prophylactic inoculation there were 9 severe cases, 7 of whom died.

Sheep-herders constitute an occupational group especially exposed to ticks. In such a group of 274 persons 94 who were protected by vaccination remained free of infection, while among 180 who were not protected there were 13 cases. In another such group of 283 persons, 99 who were protected furnished only one case, while 184 who were unprotected furnished 9 cases.

Laboratory workers engaged in the hazardous search of the preventive (physicians, entomologists and laboratory attendants) have constituted the group especially exposed to infected ticks and infected laboratory animals and since 1902 the number of persons so exposed has been 75.

Until 1924 these workers knew no special prophylactic inoculation, and of 16 of the earlier workers so exposed 6 contracted the disease and all died. But since 1924 there have been 59 laboratory workers all of whom have received prophylactic inoculation and among these there have been seven cases all of whom recovered, except one who received only one of the two requisite prophylactic doses.—*United States Public Health Service.*

DURRETT RENEWS CRITICISM OF ANTISEPTIC ADVERTISING

Dr. J. J. Durrett, chief of the division of drug control, Food, Drug and Insecticide Administration, in a recent radio address over station WRC and the National Broadcasting System reiterated his administration's criticism of advertising claims made for some antiseptic mouth washes and gargles. Publishers are referred to bulletins 348 and 349 for previous reports of the activities of the Department of Agriculture in this field.

Although the food and drug law forbids the appearance of improper claims on labels, according to Dr. Durrett, it "does not prevent such claims being made in advertisements, and this is why it is safer to judge what a mouth wash and gargle is, and what it is capable of doing, by the statements made on the label rather than by those made elsewhere".

The labels of widely distributed antiseptics are at this time comparatively accurate in their claims, Dr. Durrett said, but continued:

"Unfortunately for the consumer, this cannot be said about the extensive antiseptic mouth wash and gargle advertisements appearing in papers and magazines which are not subject to regulation by the food and drug law. However, improvement in this field may be expected now that the Federal Trade Commission is proceeding against this type of abuse of public confidence. The National Better Business Bureau, coöperating with many newspapers and magazines, is also discouraging fraudulent advertising. Much remains to be done along this line."

Dr. Durrett remarked as follows concerning the type of claim which the administration considers improper:

"Many preparations of this class are modestly labelled as deodorant cleansing, antiseptic mouth washes and gargles. The only reason why they are labelled antiseptic at all is because they possess the ability to kill bacteria in a test tube under favorable conditions. Irrespective of the ability of these mouth washes and gargles to reach the germs of disease located deep in the inaccessible recesses of the mouth, tonsils, adenoids and other parts of the upper respiratory tract, you are eloquently and even at times spectacularly persuaded, urged or frightened by advertising into gargling, after which it is implied that you may feel safe and secure from the germs or from 30 to 50 diseases which the manufacturer tells you start by first attacking the mouth, nose, or throat.

"What do the best informed workers in this country in this field think of such claims? After exhaustive experiments on rabbits, using eight or ten different varieties of the best and most accredited antiseptics, one group of outstanding workers concluded that antiseptic mouth washes and gargles when dropped into the noses of rabbits, are devoid of beneficial influences in removing disease-producing germs; that in some instances an actual increase in disease-producing germs occurs; that there is no possibility of freeing the upper respiratory passage of disease-producing germs by treatment with antiseptic solutions; and that great harm can be done by putting irritating solutions into the nasal passage.

"Meaningless jargon, purporting to be scientific facts, is used in many advertisements to impress those who are seeking an antiseptic mouth wash and gargle to kill the germs which they have been led to believe are about to attack them. A recent statement said that the preparation referred to had such strong effect that it would destroy 1,400,000,000 germs in 15 seconds, and went on to explain that the law in the United States required such a preparation to kill 200,000,000 germs in 300 seconds. Such a statement is incorrect and means absolutely nothing. These big figures are used solely for the purpose of impressing the unsuspecting public with the great power of the preparation, when, as a matter of fact, any antiseptic mouth wash and gargle meeting only the minimum requirements, easily accomplishes such results. These statements are loosely based on test-tube experiments and they only have to use a bigger tube, more antiseptic and more germs, and the figures can be raised to any desired size.

"Remember that as antiseptic mouth washes and gargles are used they are weakened by dilution with saliva; that they are only in the mouth and throat as a rule once or twice during a day and then only for a few seconds out of the 24 hours; and that they cannot possibly reach many of the folds and inaccessible recesses in which the actual sites of many beginning infections are located.

"Mouth washes and gargles are legitimate and useful agents when recommended and used for what they are capable of doing. If they are antiseptic, there is no possible objection to designating them as such. Many of them are cleansing, soothing, refreshing and tend to mask odors arising in the mouth. Because of the very nature of the limitations attending their use, as outlined above, they cannot be depended upon to prevent or cure infectious diseases of the upper respiratory tract such as, for example, sore throat."—*National Better Business Bureau.*

THE NURSE THE DOCTOR WANTS

The ideal nurse for the present-day physician is one who has good breeding and an attractive personality, skill in giving general care and making patients comfortable, who can observe and report symptoms well, takes care to follow medical orders and is adept at handling people.

This picture of the perfect nurse was ascertained from questionnaires sent to doctors in many branches of medicine, by the Committee on the Grading of Nursing Schools, which is conducting a five-year study of nursing and its problems. The above qualifications were the five most stressed by the more than 4,000 physicians from all parts of the country who answered the queries.

Just how the various requirements for a good

nurse rank in the minds of the physicians as a whole, may be seen from the following:

65% want the nurse to have skill in general care.

65% want the nurse to have skill in making the patient comfortable.

45% want the nurse to have skill in observing and reporting symptoms.

43% want the nurse to have care in following medical orders.

34% want the nurse to have good breeding and attractive personality.

30% want the nurse to have skill in handling people.

28% want the nurse to have skill in asepsis.

27% want the nurse to have familiarity with hospital routine.

22% want the nurse to have experience and background.

21% want the nurse to have familiarity with their personal methods.

15% want the nurse to have ability to work under a heavy strain.

15% want the nurse to have familiarity with a particular disease.

3% want the nurse to be a responsible adult to take charge of the family.

3% want the nurse to be a mother's helper and houseworker.

The modern physician thus places the old-fashioned concept of a nurse as "a pair of hands and feet" at the bottom of the list. His demand now is for a woman of good background, of high professional principles, with thorough training and experience in the actual care of the patient, as nurse for his cases.

The study shows the demand for practical nurses by physicians is steadily dropping, with 84% preferring the graduate, registered, trained nurse at all times for their own cases, and an additional 8% preferring them always for certain types of cases.

The general practitioner and the internist are most interested in the ability of the nurse to give general care, 69% and 70%, respectively, registering for this quality, as compared with the average percentage of 65. The neurologist is least interested in it, though more than half of those questioned checked for it.

Skill in observing symptoms is most desired from the nurse by the surgeon, neurologist, obstetrician and pediatrician. The three last-named groups also had a more than average interest in the qualification of good breeding and personality. The surgeon emphasized skill in asepsis and care in following medical orders as well.

The neurologists are by far the most interested in having for their patients nurses who can handle people, 61% checking this, as compared with an average of 30%.

Nurses who take particular care to follow orders shine brightest in the eyes of the pediatricians, 57% of them desiring this qualification, while the average demand is 43%. The surgeon and the obstetricians are most interested in having nurses familiar with hospital routine and their personal methods.

Nine out of ten physicians reported they are getting the nurses they want and would be glad to take the nurse on their last case back again. The surgeons were the group most satisfied, 63% of them marking their nurses with the highest rating.

Some of the typical comments made by the physicians, that show what they appreciate in nursing care specifically, were:

"A good observer, gentle, thorough. She follows orders explicitly and reports changes promptly." "My nurse has a sense of humor, which helps a lot." "She kept hordes of anxious relatives and friends out of the room." "She has always been cheerful." "She combined a good technical training with common sense." "She carried out orders but modified them when the need was obvious." "She had a proper sense of the dignity of the position." "She is intelligent, observing, not afraid to take a severe case twelve miles in the country." "She was a good cook and knew how to handle people." "There has been a very distinct improvement in the patient's mental condition during her stay in the hospital."

"Her asepsis was perfect." "She was of great value in preventing a psychosis from developing." "One of the nurses was exceptionally good-natured and tolerant." "Anyone who can feed a patient a half-pound of cooked liver daily for four or five months deserves credit for being a good cook and knowing how to handle people." "She sees to it that even the family are happy."—*Martha Dreiblatt, Committee on the Grading of Nursing Schools, 370 Seventh Avenue, New York City.*

LIGHT IN SHADOWED LIVES—THE SIGHT-SAVING CLASS

By Alice F. Loomis

American Child Health Association

Among the millions of children attending our public schools there are some tens of thousands who have such poor eyesight that even with properly fitted glasses they cannot see and cannot hope to see well enough to go through school in the usual way. There are others suffering from progressive eye diseases who could only do so at the expense of ruined eyes or eyes seriously impaired. What are such children to do to secure an education?

In recent years, in a few places, special sight-saving classes have been organized. The number is growing rapidly and at the end of 1929, 350, distributed in 95 cities and 21 states, could be counted. But this number seems a mere drop in the bucket when we learn that approximately 4650 such classes are needed to accommodate the children who should have this special care.

This crying need is being made the chief concern of the Sub-Committee on the Blind and Visually Handicapped, of the White House Conference on Child Health and Protection, on which the National

Society for the Prevention of Blindness is actively represented, and we may expect a stimulus to the movement through their studies and reports.

What are sight-saving classes and why are they so few?

The fundamental problems in sight-saving classes are to save the residue of sight in each child in the class, and to keep him on the same educational level as other children of his age in the regular classes.

There are two types of sight-saving class.

In the first, the children remain through their school life as a segregated group. In the other, they are thrown as much as possible with the normal children of their age. They go to the regular grades for oral work, physical education, or rote singing, returning to the special class for any work requiring concentrated use of the eyes. The latter type of class is growing in favor since it tends to throw the children more nearly into normal life.

Since each child is an individual problem the classes must necessarily be small and as one class usually serves a whole school or perhaps a whole neighborhood the pupils are of all ages.

Though the methods of conducting sight-saving classes are constantly being revised and improved there are certain conditions and certain equipment which are fundamental: Sufficient light for every child; absence of glare from blackboards, desk tops, walls, or books; adjustable seats and desks; typewriters with large size type, and books printed in 24 point or larger type.

The children are given enough "book knowledge" to supply them with an educational foundation, but no effort is made to encourage in them a love of reading, which in later life could never be safely indulged. Throughout their school career they are being taught how to adapt themselves to their limitations, and how to care for their sight after they leave school. To a certain extent the schools are prevocational, and experiments are being tried in making a truly vocational junior high school for children handicapped through poor vision. In Detroit and Cleveland vocations for girls and boys respectively are being analyzed to determine the opportunities they offer. It is sometimes harder for these boys and girls to fit themselves into life than for the blind, since for the latter there is no question of eyestrain, whereas for the partially sighted this is a constant menace.

Sight-saving classes are too few, both because the movement is yet young and the need for them not universally recognized, and because there is a scarcity of teachers qualified to teach them. Courses for the training of supervisors and teachers in this work are being offered in a few but an increasing number of educational institutions. Columbia University, New York University, the Universities of Southern California, Cincinnati, Chicago and Detroit, and the State Normal Colleges at Buffalo, New York, and Ypsilanti, Michigan, are among those offering courses.

A few state departments of education have formulated training requirements. Where the need is urgent, teachers are sometimes prepared for this work by special reading followed by examination, or by training given to the teacher in service by the supervisor. Whatever the training, the prime objects are a knowledge of eye conditions and a flexibility of method that will insure day by day the maximum protection for each individual child.

VIT-O-NET CORPORATION

Commission Curbs Electro-Magnetic Blanket Exploitation

On July 7, 1930, the Federal Trade Commission ordered the Vit-O-Net Corporation (see bulletins Nos. 109, 202) manufacturers of a so-called Vit-O-Net Magnetic blanket, to cease and desist from representing:

1. That said blanket will prevent, relieve, benefit or cure all diseases of the human body.
2. That said blanket is based upon or makes practical application of scientific discoveries or theories of well-known scientists for the benefit, cure or prevention of human diseases or ailments.
3. That said blanket was discovered, originated, invented or developed by a scientist.
4. That numerous tests or experiments have been made with said blanket which prove it to have any therapeutic value except as a heating pad and because of the heat generated in it by the electric current passing over the wires in it.
5. That said blanket sets up a radio-magnetic or electro-magnetic energy which is transmitted to the person using said blanket or which had any effect upon a person using said blanket.
6. That the magnetic field of said blanket magnetizes the body or any part of the body or sets up electric currents in the body or any part of the body.
7. That said blanket is used, endorsed or recommended by prominent or well-known physicians, scientists, hospitals, educators or other prominent or well-known persons or has been tested by institutions for medical or scientific research when such is not the fact.
8. That from the use of said blanket there is any effect upon the human body or any part thereof or any tissue or cell thereof other than that caused by the heat generated in the blanket by the electric current passing over the wires of said blanket, that is, except as a heating pad.
9. Falsely the number of said blankets sold, the users of said blankets or the purposes for which used.

The dominant principal in this enterprise appears to have been W. F. Craddick who styled himself "Doctor" having obtained a "degree" of "Doctor" from the "College of Drugless Physicians," Indianap-

olis, Indiana, of which one T. J. Briggs was head. Craddick had been enrolled as a student for two weeks and had arranged to send students to Briggs in return for the "degree" ordinarily costing $250. He is not a scientist, physician or electrician and has had only an eighth grade education. Craddick has sold electric blankets since 1911. He developed the Vit-O-Net blanket in collaboration with a Mr. Charles who also acquired the title of "Doctor" but was not a physician. The blanket was first sold in 1918 or 1919 as the "Electronet." It is now being sold as the "Magnecoil." The Commission issued a complaint against Magnecoil Company, Inc., Salt Lake City, on June 16, 1930. The Vit-O-Net Manufacturing Company was organized about 1920 and sold all its assets to the Vit-O-Net Corporation, organized in November 1927.

The blanket itself was first sold as an electric heating pad until an electrician told Craddick that the current passing over the wires in the blanket developed a magnetic field. And so in 1928 and 1929, the Vit-O-Net Magnetic Blanket was advertised as "the greatest health discovery in recent years".

The Commission found that "magnetism has no therapeutic effect on the human body or on any of the tissues or cells or on any diseases of the body". It found that the only therapeutic effect of the blanket is as a means of supplying heat treatment and that its use in certain diseases is dangerous to health and life.—*National Better Business Bureau, Inc., Commercial Department.*

CORRESPONDENCE

THE SEVENTH CONFERENCE OF THE INTERNATIONAL UNION AGAINST TUBERCULOSIS HELD AT OSLO, NORWAY, AUGUST 12-15, 1930

Mr. Editor:

On August 20 a part of the American delegation bound for the Tuberculosis Conference at Oslo sailed on the Norwegian-American Line Steamer Stavangerfjord for Bergen and Oslo in Norway.

Dr. Kendall Emerson, formerly of Worcester, and now the Managing Director of the National Tuberculosis Association, was the leader of the party, being the official representative of the United States Government. With him were Mr. Fred Hopkins the Executive Secretary of the National Tuberculosis Association; the colorful Hungarian, Dr. Camille Keresturi who has done such careful painstaking work on B. C. G., under the direction of Dr. Wm. H. Park of New York; Dr. Benjamin Goldberg of Chicago, author and enforcer of the Illinois law which makes it imperative that children shall not live in contact with active cases of tuberculosis, and who deserves much credit for being able, in spite of the political conditions existing in Chicago, to bring about a marked diminution in the amount of tuberculosis in the city. Next Willard B. Soper of the Yale Medical School who was well chosen to discuss the teaching of tuberculosis in medical schools.

The two Boston men, Page and Stone, were onlookers rather than active participants in the game, while Dr. Kidner a rolling stone that has acquired an indefinite amount of moss while rolling about the world and having become a consultant on hospital construction added interest to the discussion. He was loaded down with plans for new hospitals and full of practical and wise suggestions for everyone interested in hospital architecture. He is a man who may well be consulted by any board of trustees who honestly wish to build a really modern hospital or ward without any waste of money. Drs. Hess and DaPughs of Chicago and New Orleans were also on the boat *en route* to the Congress at Stockholm.

The Stavangerfjord is a staunch boat, clean and spotless, with no "ship smells" and plenty of deck room for chairs, walkers, and deck sports. Few people realize that one can go to Copenhagen or Hamburg by the Norwegian Line, landing in Bergen and crossing Norway to Oslo and thence to Hamburg with the privilege of making side trips into the fjords or points of interest in the mountains, for the same price as a direct ticket to Hamburg by other lines. The food was good, though distinctly Norwegian. Leaving New York Saturday, August 2, the boat docked at 2 A. M. Monday, August 11. Bergen, noted for its 72 inches of rain each year, welcomed us with bright sunshine showing to perfection the wonderful green of the hills surrounding the town. By noon we were in the clouds and snow fields that cover the backbone of Norway. Thence the train dropped gradually to sea level through the farming districts outside of Oslo.

At noon Tuesday the Conference was opened in a very formal manner in the main hall of the University. All delegates were requested to be in their seats at ten minutes before noon. At exactly twelve o'clock the Royal Family of Norway entered. The Symphony Orchestra then rendered a selection from Grey, one of Oslo's world known composers. A cantata which had been written for the occasion was given with a recitation by a most handsome descendant of the Vikings and various responses by good voices, after which came the formal address of welcome and reports of progress by the president and secretaries. I have dwelt on this opening for so many of our medical meetings are opened with no more formality than a few weil mumbled words by the president.

In the afternoon many of us visited the Studio of the Sculptor, Vigeland—'tis said that the city gave him a commission to decorate a new bridge with statues, building him a studio for his work and furnishing him his living. After two or three years the taxpayers became restive, wondering whether he had really produced anything or was simply living on their bounty. So loud became the grumbling that recently he had arranged to have his studio opened to the public and to the amazement of all there was a most marvelous amount of sculpture to show. How a selection can be made for the bridge passes lay comprehension for the collection contains the portrayal of every stage of human existence from the fetus to the grave and of every possible human emotion.

In the evening of the same day the municipality of

Oslo gave a reception and supper in the buildings within the old fortifications to all attending the Conference. The guards about the fort were all clad in Mediaeval uniforms for the occasion. Next day Wednesday at 8:30 A. M., ye Gods think of it, 8:30 A. M. the Scientific Meetings started with Prof. Calmette who reported on the B. C. G. vaccination against tuberculosis. The paper was a positive expression of Calmette's personal belief in the efficacy and innocuousness of his B. C. G. vaccination; also that he preferred the oral method of administration. Prof. Neufeldt of Berlin followed and in the most graceful way acknowledged Germany's appreciation of the importance of the work of Calmette. A word of caution was given that really it will take a full generation to prove fully the claims made for the B. C. G. by its supporters. Later the request was made that all reference to the unfortunate Lubeck results should be eliminated from the discussion as an official investigation was in progress to determine whether there could have been any slip in the laboratory technique or in the material given to the clinicians. (In the hotel lobbies it was hinted that the records had somehow disappeared and that the investigation will end like many of our Senate's similar proceedings.) Country after country followed with reports of their experience with the use of B. C. G. and for the most part they supported the position taken by Calmette. Indeed it was gossip that the stage had been carefully set to insure the triumph of Calmette. Be that as it may only a few discordant notes notably Watson of Canada and also some of the Germans were most outspoken in their unbelief of the harmlessness of the vaccination.

Dr. W. H. Park of New York presented his favorable statistics and conclusions and in a most courteous manner voiced his points of disagreement with Petroff's conclusions. (Petroff having been referred to frequently by those in opposition.) Park's words were all the more notable in the light of the direct and almost bitter attitude of Petroff in a recent New York address. Dr. Keresturi showed fine colored slides demonstrating the advantages of the *infradermal method.* However, after all had been said, if the oral method of administration has anything like the success claimed for it, it is the only one which can be used on a large scale, for the public will not stand for hypodermic injections and slowly healing indurations with possible cold abscesses if the technique is at all faulty.

The discussion of B. C. G. lasted all day. The following morning Prof. Ball of Oslo gave a conservative paper on "Thoroplasty in the Treatment of Pulmonary Tuberculosis." He advocated a two stage operation as the safer proceeding. He also stated that sanatorium physicians could easily acquire the necessary technique and therefore this valuable operation should be at the command of everybody. Later he showed some of his clinically satisfactory results. He was followed by the dynamic Prof. Saurbruch of Germany. He had had a much greater clinical experience than Prof. Ball. He was enthusiastic for the good to be obtained from the operation and with over 2000 cases performed was sure of his ground. He certainly inspired his hearers with his personality and vigor and honest belief in the alleviating and curative results to be obtained from operative measures. It was with regret that neither of the Matsons of Portland, Oregon, were present to report their brilliant work. Other countries were well represented at both the morning session and in the afternoon's discussion.

Friday the third day of the session was devoted to the teaching of Tuberculosis to medical students and to physicians, Prof. His of Berlin reading the leading paper. America was well represented by Dr. Willard B. Soper of the Yale Medical School. While the problem in one way is the same everywhere, conditions are so unlike in the various countries of the world that there must necessarily develop a wide difference in details of such teaching.

To sum up: The Conference centered about Calmette and the meeting held as it was on neutral ground gave the German and French physicians a chance to come together, and all united in the great struggle to destroy this still powerful plague. In spite of all favorable reports, one must bear in mind that in Norway the city tuberculosis death rate is still 125 and for the whole country over 150, and that in our own New England, while the rate is as a whole much lower nevertheless the death toll in the active years of life is still appalling. Therefore any such international meeting must stimulate the workers to greater zeal in their efforts to do away with this preventable disease.

ARTHUR K. STONE.

Munich, August 26, 1930.

A REVIEW OF FRACASTORIUS ON CONTAGION

Columbia University
College of Physicians and Surgeons
Institute of Public Health

September, 12, 1930.

Editor, *New England Journal of Medicine*
165 Newbury Street, Boston, Mass.

Dear Doctor:

Dr. Charles V. Chapin of Providence has just sent me the enclosed review that he has written on receipt from the publishers of the translation of Fracastorius' classical book on Contagion which I was instrumental in having translated and published for the first time in English. If appropriate for the *New England Journal of Medicine* will you please print it under Dr. Chapin's name.

Cordially,

HAVEN EMERSON, M.D.

FRACASTORIOUS
"Contagion"
W. C. Wright
G. P. Putnam's Sons, 1930 Price $4.50

Epidemiologists and practicing health officers who have the responsibility of the control of contagious diseases will be very grateful to G. P. Putnam's Sons for publishing the work of Fracastorius on Contagion. They will also feel greatly indebted to Doctor Wright for translating into English the

original Latin which, for most of us, is indeed a dead language. How carefully he has done his work is attested by the copious and useful notes, without which many things in the text would be unintelligible to the modern reader. Fracastorius has been so often referred to, and quoted from, by writers on public health, that it is a great satisfaction to learn from these printed pages what he really did write and think.

The fact that contagion was recognized as far back as biblical times, but its importance in a considerable number of specific diseases was set forth by Fracastorius so much more clearly than by any before him, that he had a profound influence on medical thought. Moreover, he defined three types of contagion now well recognized, by direct contact, by means of fomites and through the air. He also asserted that invisible germs, which can reproduce themselves indefinitely, are the true cause of contagious disease. That he went far astray in many of his ideas about germs and their relation to disease was unavoidable in view of the lack of biological knowledge at that period.

It is indeed interesting to learn that Fracastorius was esteemed a poet of no mean ability by his contemporaries. A poet must have imagination and so must a scientist to invent his hypotheses, without which his observations and experiments are fruitless. Unfortunately, Fracastorius did not, as indeed many physicians today do not, appreciate the need of testing every theory, however specious. It is perhaps owing chiefly to this author's clear statement of the germ theory that men persisted so earnestly in the search for germs for the next 300 years.

CHARLES V. CHAPIN, M.D.,
Providence.

MATTER OF INTEREST WITH RESPECT TO THE ASSOCIATION OF MILITARY SURGEONS

September 5, 1930.

Dr. Walter P. Bowers, Managing Editor,
The *New England Journal of Medicine:*

My dear Doctor Bowers:

In accordance with the policy outlined by the Secretary of War, the Hon. Patrick J. Hurley, and the Surgeon General of the United States Army, Major M. W. Ireland, I am writing this letter to ask your coöperation in carrying forward the progressive spirit of the Association of Military Surgeons of the United States.

It has a most important service to perform, but its great destiny can only be achieved through the earnest support of those men who have been in the service and know the necessity for united purpose and action.

I am enclosing herewith copies of letters from the Secretary of War and the Surgeon General which will clearly emphasize the value of this organization.

The annual dues of the Association of Military Surgeons are only three dollars including the Journal, "The Military Surgeon." This is a splendid journal, most efficiently edited, thoroughly scientific, complete in its military and medical information, and is a fine medium through which all medical officers can publish their professional work. I would greatly appreciate your help in securing the names of such officers in your community, who are not already members, but are willing to join the organization. I will then transmit these names to the editor, Brig. Gen. Jefferson R. Kean, Washington, D. C., who will communicate with them at once. I hope that we may receive a prompt and favorable answer as I should be very much delighted to receive a fine record from your section so that it may be included in our full report at the meeting in Philadelphia.

With best wishes, and thanking you in advance for your coöperation, I am

Sincerely yours,

JOHN O. MCREYNOLDS
President of the Medical Veterans of the World War,
"Section of Association of Military Surgeons of the United States."

COPY OF A LETTER TO DR. MCREYNOLDS WITH RESPECT TO THE ASSOCIATION OF MILITARY SURGEONS

War Department
Office of Surgeon General
Washington, D. C.

Colonel John O. McReynolds, Aus. Res. U.S.A.,
907 Mercantile Building,
Dallas, Texas.

My dear Colonel McReynolds:

I am writing to ask your assistance in extending membership in the Association of Military Surgeons among the members of our profession. I do not know of any better way in which we can emphasize the military obligations to our country of the medical profession than by all of us becoming members of this Association, the special duty and aim of which is to keep alive a knowledge of military medicine during the times of peace. I am sending you herewith a copy of a letter which the Secretary of War has recently given me expressing his feeling in this matter.

As you are president of the Medical Veterans' Association, it seems to me that you can, with special appropriateness, bring this matter to the attention of the Medical Veterans. Will you not do it, and come to the next meeting of the Medical Veterans with a strong enrollment of new members for our Association?

Cordially yours,
(Signed) M. W. IRELAND,
Major General, Surgeon General.

War Department
Washington, D. C.

Major General M. W. Ireland, U. S. A.,
The Surgeon General,
Washington, D. C.

My dear General Ireland:

I appreciate the truth of your statement that military medicine is a special branch of medical science, which, on its administrative side is entirely distinct, and in its professional methods differs in

many respects from the practice of medicine in civil life. Also it is natural that these distinctive features are soon forgotten in time of peace. Therefore, the Association of Military Surgeons is doing a fine and patriotic work in its efforts to keep the medical profession of our country informed on this subject, and to make available and keep up-to-date the literature of military medicine. It is obviously desirable that medical officers of the Reserve Corps and of the National Guard should be members of this Association and should support its work of medical preparedness. I am, therefore, strongly in sympathy with your desire to extend the membership of the Association, and am glad to give aid and encouragement to this end.

Very sincerely yours,
(Signed) PATRICK J. HURLEY,
Secretary of War.

NOTICES

DR. S. H. EPSTEIN HAS OPENED AN OFFICE AT 484 COMMONWEALTH AVENUE

Dr. Epstein is in charge of the Neurosyphilis Clinic at the Boston Psychopathic Hospital and assistant in the Department of Therapeutic Research under Dr. H. C. Solomon.

SPECIAL NOTICE

See notice of lecture on Medical Diagnosis and Treatment, page xi, advertising section.

NOTICES OF MEETINGS

NEW ENGLAND SURGICAL SOCIETY

PROGRAM

ANNUAL MEETING, 1930

Headquarters
Hotel Statler—Parlor F—Mezzanine Floor
Boston, Massachusetts

Friday, September 26—Saturday, September 27

GENERAL PROGRAM

FRIDAY, SEPTEMBER 26, 1930
BOSTON, MASS.

A. M.

9.00 Deaconess Hospital.
Clinics.
Papers:
"A Two Stage Combined Abdomino-Perineal Operation for Cancer of the Rectum." Dr. Frank H. Lahey.
Discussion: Dr. Daniel F. Jones, Boston, Mass.; Dr. William F. Verdi, New Haven, Conn.
"Total Gastrectomy for Cancer of the Stomach." Dr. Howard M. Clute and Dr. Robert L. Mason.
Discussion: Dr. Edward Richardson, Boston, Mass.; Dr. A. M. Rowley, Hartford, Conn.

9.00 Free Hospital for Women—Brookline.
Clinics.

11.00 Children's Hospital—Brookline.
Clinics.

11.00 Huntington Memorial Hospital.
Clinics.

P. M.

1.15 Luncheon.

2.00 Scientific Program—Harvard Medical School.

5.00 Tea for Members and their wives at the home of Dr. and Mrs. C. G. Mixter, Brookline, Mass.

7.00 Annual Dinner at the Harvard Club.

SATURDAY, SEPTEMBER 27, 1930

A. M.

9.00 Boston City Hospital.
Clinics.
Paper:
"Abscess of the Spleen." Dr. Irving J. Walker, Boston, Mass.
Discussion: Dr. Richard Miller, Boston, Mass.

9.00 Massachusetts General Hospital.
Clinics.
Papers:
"Relief of Pain by Sympathectomy." Dr. William J. Mixter, Boston, Mass.
"Cancer of the Prostate without Urinary Symptoms." Dr. J. D. Barney, Boston, Mass.

11.00 Peter Bent Brigham Hospital.
Clinics.

P. M.

1.15 Luncheon.

2.00 Annual Business Meeting at Harvard Medical School.
Report of Fracture Committee. Dr. Arthur W. Allen, Secretary.
Specimen "Foreign Body from Bladder". Presented by Dr. James W. Jameson, Concord, N. H.

2.30 Symposium on Vascular Lesion of the Extremities.

2.30 Operative Treatment of Thrombo-Phlebitis of the Lower Extremities. Dr. John Homans, Boston, Mass.

2.55 Development of the Collateral Circulation. Dr. Samuel C. Harvey, New Haven, Conn.

3.15 Alcohol Injection of the Sensory Nerves and Non-specific Foreign Protein. Dr. R. H. Smithwick, Boston, Mass. (By invitation.)

3.35 Diagnostic Novocain Block and Sympathetic Neurectomy. Dr. J. C. White, Boston, Mass. (By invitation.)

3.55 Peripheral Embolectomy and General Management of Peripheral Circulatory Disturbances. Dr. A. W. Allen, Boston, Mass.

4.20 Discussion of the above papers.

SCIENTIFIC PROGRAM

I "Uterine Fibroids and Pregnancy." Dr. Richard S. Benner, Springfield, Mass.
Discussion: Dr. Arthur H. Morse, New Haven, Conn.; Dr. Frank A. Pemberton, Boston, Mass.

II "Atelectasis." Dr. Carleton R. Metcalf, Concord, N. H.
Discussion: Dr. Wyman Whittemore, Boston, Mass.; Dr. Frederick B. Sweet, Springfield, Mass.

III "A Case of Kohler's Disease." Dr. D. C. Patterson, Bridgeport, Conn.
Discussion: Dr. George W. Hawley, Bridgeport, Conn.

IV "Some Causes of Failure in the Operative Treatment of Inguinal Hernia." Dr. Emery M. Fitch, Claremont, N. H.
Discussion: Dr. James B. Woodman, Franklin, N. H.; Dr. Thomas W. Luce, Portsmouth, N. H.

V "Denervation and Displacement of the Ureter for Kidney Colic." Dr. Thomas N. Hepburn, Hartford, Conn.
Discussion: Dr. William C. Quinby, Boston, Mass.; Dr. W. O. Wilder, Springfield, Mass.

VI "Fractures of the Head of the Tibia Entering into the Knee Joint." Dr. Paul P. Swett, Hartford, Conn.
Discussion: Dr. Robert B. Osgood, Boston, Mass.; Dr. James W. Sever, Boston, Mass.

VII "Notes on Tumors and Near Tumors of Bone." Dr. Frederic J. Cotton, Boston, Mass.
Discussion: Dr. Channing Simmons, Boston, Mass.; Dr. P. F. Butler, Boston, Mass. (By invitation.)

OFFICERS OF THE NEW ENGLAND SURGICAL SOCIETY

President: David Cheever, M.D., Boston, Mass.
Vice-President: Arthur T. Jones, M.D., Providence, R. I.
Secretary: J. M. Birnie, M.D., Springfield, Mass.
Treasurer: P. P. Johnson, M.D., Beverly, Mass.
Recorder: W. G. Phippen, M.D., Salem, Mass.

EXECUTIVE COMMITTEE

Officers of the Society; Lyman Allen, M.D., Edward R. Lampson, M.D., James B. Woodman, M.D., William H. Bradford, M.D., Philemon E. Truesdale, M.D.

COMMITTEE OF ARRANGEMENTS

J. Dellinger Barney, M.D., Chairman; Horace Binney, M.D., William P. Graves, M.D., Daniel Fiske Jones, M.D., Charles G. Mixter, M.D., Channing C. Simmons, M.D., Wyman Whittemore, M.D.

FALL TOURNAMENT OF THE MIDDLESEX SOUTH DISTRICT MEDICAL GOLF ASSOCIATION

Those who attended the spring tournament of the golfing members of our Society at the Arlmont Country Club last June will be interested in the announcement that a fall tournament will be held at the Oakley Country Club, Watertown, Massachusetts, on Thursday, September 25.

The tournament will be an eighteen hole medal affair using full handicap.

Play will begin at 1 P. M. At 6 P. M. dinner will be served at the Club House.

There will be a prize for first and second gross and first and second net.

In case you do not get a notice of this meeting get in touch with the Secretary at once. We want everybody to attend and make this tournament an even greater success than the last one.

We can promise you a round of golf on a beautiful course, plenty of good fellowship, and to finish off the day, an excellent dinner.

C. T. WARREN, *President,*
W. T. O'HALLORAN, *Vice-President,*
S. M. BIDDLE, *Secretary-Treasurer.*

SOCIETY MEETINGS, CONGRESSES AND CONFERENCES

March-October — International Medical Postgraduate Courses in Berlin. Complete notice appears on page 853, issue of October 24, 1929.

September 26-27—New England Surgical Society. Detailed notice appears on page 611.

October 13-17—Clinical Congress of the American College of Surgeons. Complete notice appears on page 1175, issue of June 12.

October 20-24—International Assembly of the Interstate Postgraduate Medical Association of North America. Detailed notice appears on page 291, issue of August 7.

October 20-31—Third Graduate Fortnight of the New York Academy of Medicine. Detailed notice appears on page 547, issue of September 11.

October 22, 23, and 24—The Annual Convention of the American Academy of Physical Therapy. Complete notice appears on page 498, issue of September 4.

October 27-30—The American Public Health Association. Detailed notice appears on page 1271, issue of December 19, 1929, and on page 547, issue of September 11.

March 23-27, 1931 — Fifteenth annual clinical session of the American College of Physicians. Detailed notice appears on page 790, issue of April 17.

July 27-31, 1931—Third International Congress of Radiology, Paris. Complete notice appears on page 385, issue of August 21.

DISTRICT MEDICAL SOCIETIES

Berkshire District Medical Society

September 19—Meeting. Detailed notice appears on page 498, issue of September 4, and on page 547, issue of September 11.

Bristol North District Medical Society

September 18—Taunton State Hospital.
April 16, 1931—Taunton Woman's Club.
September 17, 1931.

Franklin District Medical Society

November, 1930-May, 1931—The meetings are held on the second Tuesdays of November, January, March and May at 11 A. M. at the Weldon Hotel, Greenfield.

Middlesex East District Medical Society

October 8—Joint meeting with Middlesex North and Essex North and South.
November 12—New England Sanatorium and Hospital, Stoneham.
January 14, 1931—Harvard Club of Boston.
March 11, 1931—At Reading.
May 13, 1931—At Wakefield.

Middlesex South District Medical Society

September 25—Fall Tournament of the Middlesex South District Medical Golf Association. Detailed notice appears elsewhere on this page.